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THE NEW INTERNATIONAL ENCYCLOPÆDIA

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KEY TO PRONUNCIATION.

ā	as in ale, fate. Also see ĕ, below.
ā̇	“ “ senate, chaotic. Also see ĕ, below.
â	“ “ glare, care.
ă	“ “ am, at.
ä	“ “ arm, father.
ȧ	“ “ ant, and final *a* in America, armada, etc. In rapid speech this vowel readily becomes more or less obscured and like the neutral vowel or a short u (ŭ).
a	“ “ final, regal, where it is of a neutral or obscure quality.
a̤	“ “ all, fall.
ē	“ “ eve.
ē̇	“ “ elate, evade.
ĕ	“ “ end, pet. The characters *ĕ*, ā, and ā̇ are used for *ä* in German, as in Gärtner, Gräfe, Hähnel, to the values of which they are the nearest English vowel sounds. The sound of Swedish ä is also indicated by *ĕ*.
ẽ	“ “ fern, her, and as *i* in sir. Also for *ö*, *oe*, in German, as in Göthe, Goethe, Ortel, Oertel, and for *eu* and *oeu* in French, as in Neufchâtel, Crèvecœur; to which it is the nearest English vowel sound.
e	“ “ agency, judgment, where it is of a neutral or obscure quality.
ī	“ “ ice, quiet.
ī̇	“ “ quiescent.
ĭ	“ “ ill, fit.
ō	“ “ old, sober.
ō̇	“ “ obey, sobriety.
ô	“ “ orb, nor.
ŏ	“ “ odd, forest, not.
o	“ “ atom, carol, where it has a neutral or obscure quality.
oi	“ “ oil, boil, and for *eu* in German, as in Feuerbach.
o͞o	“ “ food, fool, and as *u* in rude, rule.
ou	“ “ house, mouse.
ū	“ “ usė, mule.
ū̇	“ “ unite.
ŭ	“ “ cut, but.
ụ	“ “ full, put, or as *oo* in foot, book. Also for *ü* in German, as in München, Müller, and *u* in French, as in Buchez, Budé; to which it is the nearest English vowel sound.
û	“ “ urn, burn.
y	“ “ yet, yield.
B	“ “ the Spanish Habana, Cordoba, where it is like a *v* made with the lips alone, instead of with the teeth and lips.
ch	“ “ chair, cheese.
D	as in the Spanish Almodovar, pulgada, where it is nearly like *th* in English then, this.
g	“ “ go, get.
G	“ “ the German Landtag, and *ch* in Feuerbach, buch; where it is a guttural sound made with the back part of the tongue raised toward the soft palate, as in the sound made in clearing the throat.
Ḥ	as *j* in the Spanish Jijona, *g* in the Spanish gila; where it is a fricative somewhat resembling the sound of *h* in English hue or *y* in yet, but stronger.
hw	“ *wh* in which.
K	“ *ch* in the German ich, Albrecht, and *g* in the German Arensberg, Mecklenburg; where it is a fricative sound made between the tongue and the hard palate toward which the tongue is raised. It resembles the sound of *h* in hue, or *y* in yet; or the sound made by beginning to pronounce a *k*, but not completing the stoppage of the breath. The character K is also used to indicate the rough aspirates or fricatives of some of the Oriental languages, as of kh in the word Khan.
n̲	as in sinker, longer.
ng	“ “ sing, long.
N	“ “ the French bon, Bourbon, and *m* in the French Etampes; where it is equivalent to a nasalizing of the preceding vowel. This effect is approximately produced by attempting to pronounce ‘onion’ without touching the tip of the tongue to the roof of the mouth. The corresponding nasal of Portuguese is also indicated by N, as in the case of São Antão.
sh	“ “ shine, shut.
th	“ “ thrust, thin.
TH	“ “ then, this.
zh	as *z* in azure, and *s* in pleasure.

An apostrophe [’] is sometimes used to denote a glide or neutral connecting vowel, as in tā’b’l (table), kăz’’m (chasm).

Otherwise than as noted above, the letters used in the respellings for pronunciation are to receive their ordinary English sounds.

When the pronunciation is sufficiently shown by indicating the accented syllables, this is done without respelling; as in the case of very common English words, and words which are so spelled as to insure their correct pronunciation if they are correctly accented. See the article on PRONUNCIATION.

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LEGISLATION.
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LEGISLATURE.
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LINE ENGRAVING.
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LISSAJOUS FIGURES.
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LITERARY PROPERTY.
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LITHOGRAPHY.
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LITURGY.
Professor L. M. Robinson.

LIVER.
Dr. Albert Warren Ferris and Dr. Frederick R. Bailey.

LIVY.
Professor George N. Olcott.

LOCOMOTIVE.
Mr. Charles Shattuck Hill.

LOG.
Lieutenant-Commander Lewis Sayre Van Duzer.

LOGIC.
Professor Evander Bradley McGilvary.

LONDON.
Mr. Cyrus C. Adams.

LONGFELLOW.
Professor William Peterfield Trent.

LOOM.
Mr. Louis Wells Clarke.

LORD'S SUPPER.
Dr. Reginald H. Starr.

LOUVRE.
Professor Arthur L. Frothingham.

LOWELL, JAMES RUSSELL.
Professor William Peterfield Trent.

LUCRETIUS.
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LUKE, GOSPEL OF.
Professor Melanchthon W. Jacobus.

LUTHER.
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LUTHERANISM.
Professor Edmund Jacob Wolf.

LYRIC POETRY.
Dr. Richard T. Holbrook.

MACHIAVELLI.
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MACHINE GUN.
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MAGIC.
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MAGNETISM.
Professor Joseph Sweetman Ames and Mr. J. B. Whitehead.

MAGNETISM, TERRESTRIAL.
Professor Joseph Sweetman Ames.

MAHABHARATA.
Professor Edward W. Hopkins.

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MALFORMATION.
Professor John Merle Coulter.

THE NEW INTERNATIONAL ENCYCLOPÆDIA

LATIUM, lā'shĭ-ŭm (from Lat. *latus*, OLat. *stlatus*, broad). Originally the name of the broad plateau on the western coast of Central Italy, lying southeast of the Tiber between the Apennines and the sea, near the centre of which rises the isolated Mons Albanus, the crater of an extinct volcano. When Rome became predominant in this region and pushed her conquests among the Volsci and Hernici and Aurunci, and other tribes that dwelt among the foothills of the Apennines, the name Latium was extended to include all the country from the Tiber to the Liris. The early inhabitants of Latium—the Latini—were a shepherd people of warlike, marauding habits, dwelling in many towns, and loosely bound into a sort of federation, with a common worship and a central shrine of Jupiter Latiaris on Mons Albanus. Their earliest towns were Ardea, Lanuvium, and Lavinium in the plain, and Tusculum on the Alban slopes. Alba Longa was also an early settlement; and from here, according to the story, which may well be based on fact, was colonized Rome (q.v.). In the course of time Rome destroyed all the neighboring towns or reduced them to a state of vassalage, and at length became the recognized head of the Latin League. One by one the powers of the Latins were reduced, their duties as allies (but not their privileges) were increased, and finally the Latin League was formally abolished. Then the towns revolted in B.C. 340, and the Latin War, which lasted for two years, put an end to their independent political existence. Again, in B.C. 89, the Latin towns took up arms against Rome in the Social War. Now, however, the confederates were thoroughly crushed, and Latium never again thought to resist the power of Rome. By the end of the Republic, all the Latin towns enjoyed the privileges of Roman citizenship.

LATO'NA (Lat., from Gk. Λητώ, *Lētō*). In Grecian mythology, the mother of Apollo and Artemis by Zeus. The oldest version of the legend is in the Homeric Hymn to Apollo. All lands refuse to receive the goddess in her need, except Delos, and the island yields only when Leto swears it shall be the specially favored seat of worship for the new god. Later legend made the jealousy of Hera more prominent, and added the tale of the fixing by Poseidon of the floating island of Delos, that it furnish a refuge. This later version also made Artemis the twin sister of Apollo. Leto was commonly worshiped in conjunction with her children, but we hear of separate shrines at Delos, Platæa, and other places. In Hellenistic and Roman times the name was given to the nature-goddess worshiped under the name of the 'Mother' throughout much of Asia Minor, and often called Artemis.

LA TOUCHE-TRÉVILLE, lȧ to͞osh'trā'vēl', LOUIS RENÉ VASSOR, Viscount de (1745-1804). A French naval officer, born at Rochefort. He entered the navy in 1757, and distinguished himself especially in the American Revolution. In 1780 he was put in command of a frigate for his bravery in the capture of a British vessel off Newport, R. I., and in the next year was wounded at Yorktown. In 1786 he took part in the framing of the Maritime Code, and three years later was Deputy to the States General from Montargis. He commanded a squadron at Brest and met Nelson and forced him to retreat (1801). At the end of the same year he was put in command of the fleet at Aix destined for Santo Domingo. He got to Port-au-Prince in time to save the city from the negroes; fortified the place, and with it as a base made several successful attacks on the British West Indies and English commerce. He succeeded in beating off the fleet sent to capture him (1803). In 1804 he took command of the French fleet in the Mediterranean, but died in the same year.

LA TOUR, lȧ to͞or, MAURICE QUENTIN DE (1704-88). A French pastel painter, born at Saint Quentin. He may be called self-taught, though he was the pupil in Paris of a little-known artist, Spoëde. He went to Cambrai when the congress was held there in 1724, and attracted so much attention that he was invited to go to London with the English Ambassador. In 1737 he began to exhibit at the Salon, to which he continued to send pictures until after 1773. In 1750 he became Court painter, with lodgings in the Louvre, where his subjects included all the notable characters of the day. He founded a free school of design at Saint Quentin, and left to the Ecole des Beaux-Arts three prizes, which are still distributed. Especially fine were his portraits of women, and among these must be mentioned seven of Queen Marie Leszczynska; the Madame de Pompadour, in the Louvre; the Dauphine Marie de Saxe; and Mlle. Fel. His best portrait of a man is that of the Abbé Hubert, and there is an interesting one of himself. His 'preparations,' or sketches for his finished picutres, are among the best of his works. Consult Goncourt, in *L'Art du dix-huitième siècle*. (Paris, 1873).

LATOUR D'AUVERGNE, dô'vâr'ny', Théophile Malo Corret de (1743-1800). A hero of the French Revolution, born at Carhaix, Finistère, of an illegitimate branch of the family of the dukes of Bouillon. He entered the army in 1767, and in 1782 served under the Duke of Crillon at Port Mahon. During the early years of the Revolution Latour fought in the armies of the Alps and of the Pyrenees. Refusing all advancement in rank, he led on foot and in a simple captain's uniform his column of 8000 grenadiers, known on account of their murderous bayonet charges as the Infernal Column. Having left the army in 1795, he reënlisted in 1799 as a substitute for the only son of an old friend, and fought with Masséna in Switzerland. When he was subsequently with the Army of the Rhine in 1800, as he still refused all promotion, Bonaparte bestowed on him the title of 'The First Grenadier of France.' He was killed on June 27th of that year, at Oberhausen, near Neuburg, in Bavaria. When he died the whole French army mourned for him three days; his heart was embalmed and placed in a silver vase carried by his company; his sabre was placed in the Church of the Invalides; and every morning, till the close of the Empire, at the muster-roll of his regiment, Latour's name was called, and the eldest sergeant replied, 'Dead on the field of honor.'

LA TRAPPE, lȧ trȧp. A narrow valley in Normandy, in the Department of Orne, closely shut in by woods and rocks, and very difficult of access. In these woods stands the famous Benedictine Monastery of La Trappe, or La Grande Trappe, notable as the place in which the Trappist Order (q.v.) originated.

LATREILLE, lȧ'trȧ'y', Pierre André (1762-1833). A French zoölogist, born at Brives, Corrèze. Although he was ordained as a priest in 1786, he devoted most of his life to the study of insects and allied animals. In 1798 he was placed in charge of the entomological collections at the Museum of Natural History in Paris, and in 1814 he became a member of the Academy of Sciences. Latreille wrote voluminously, his works extending over the entire field of zoölogy; but it is as an entomologist, and a reformer of the prevailing systems of classification, that he was most famous. The following are among his more important works: *Précis des caractères génériques des insectes disposés dans un ordre naturel* (1796); *Histoire naturelle générale et particulière des crustacés et insectes* (1802-05); *Cours d'entomologie* (1831-33).

LA TRÉMOILLE, lȧ trȧ'mō'y', or **TRÉMOUILLE**, trȧ'mōō'y', Louis II. de, Vicomte de Thouars, Prince de Talmont (1460-1525). A French soldier. In 1488, in command of the army of Charles VIII., he defeated the rebel forces under the Duke of Brittany at Saint-Aubin de Cormier, took prisoner the Duke of Orleans, and massacred the other captives after having banqueted them. In 1495 he distinguished himself in the victory of Fornovo. By Louis XII. he was placed in command of the Army of Italy. He took Milan in 1500, and was appointed admiral of Guienne (later of Brittany), and Governor of Burgundy. In 1503 he fought unsuccessfully against Gonsalvo de Córdova in the Neapolitan territories. In 1513 he was defeated by the Swiss at Novara, in 1515 distinguished himself at Marignano, and defended Picardy against the English and Imperialists in 1522-23. He was killed at Pavia, February 24, 1525.

LATROBE, lȧ-trōb'. A borough in Westmoreland County, Pa., 41 miles east of Pittsburg; on the Loyalhanna Creek, and on the Pennsylvania and other railroads (Map: Pennsylvania, B 3). It is the centre of a fertile agricultural district which has valuable deposits of coal and iron ore. Several coal-mines are worked. There are large coke ovens, steel-mills, paper, lumber, and flour mills, and manufactories of glass, bricks, farm machinery, etc. Population, in 1890, 3589; in 1900, 4614.

LATROBE, Benjamin Henry (1764-1820). A distinguished British-American architect, descended from the Huguenot Henry Boneval de la Trobe. He was born in Yorkshire, England; studied on the Continent; achieved professional distinction as an architect in London; and in 1796 emigrated to the United States, where he became eminent both as an engineer and as an architect. Among the works with which his name is associated are the James River and Appomattox Canal, the Chesapeake and Delaware Canal, and the Schuylkill River water-works in Philadelphia. He was the architect of the Bank of Pennsylvania, the Academy of Art, and the Bank of the United States in Philadelphia, and of the Roman Catholic Cathedral and the Custom-House in Baltimore. In 1803 he was appointed by Jefferson surveyor of public buildings in Washington, and his advice had much to do with the plans and decorations of the Capitol. He was engaged to rebuild the Capitol after it was burned in 1814. In 1817 he gave up his connection with the Government, and went to New Orleans, where he was engaged in the construction of the water-works, until his death, in that city.—His son, Benjamin Henry (1807-78), likewise a distinguished engineer was for twenty-two years chief engineer of the Baltimore and Ohio Railroad, and afterwards was a consulting engineer of the Hoosac Tunnel, and a member of the Advisory Board of the Brooklyn Bridge.—The son of the second Benjamin Henry, Charles Hazlehurst (1833-1902), was also a skillful and famous engineer, to be remembered for his construction of the Arequipa Viaduct in Peru and the Agua de Vernegas Bridge in Peru, and for his authoritative studies of Baltimore sewerage.

LATROBE, John Hazlehurst (1803-91), son of Benjamin H. Latrobe (1764-1820), born in Philadelphia. He became a cadet in the United States Military Academy at West Point, and subsequently studied law with Robert G. Harper, of Baltimore, and was called to the bar in 1825. His services as counsel were soon engaged by the Baltimore and Ohio Railroad, with which he remained connected until his death. He was also engaged by Ross Winans in certain important litigations before the Russian courts, respecting the construction of the railroad between Saint Petersburg and Moscow. The well-known 'Latrobe stove' or 'Baltimore heater' was his invention. Aside from his professional duties, he was conspicuous in his devotion to the welfare of Baltimore. Druid Hill Park owes much to his care. He was one of the founders and a life-long promoter of the Maryland Institute. For many years he was president of the Maryland Historical Society. Among the advocates of African colonization he was perhaps the foremost. For the colony of Maryland in Liberia, established at Cape Palmas, he prepared a charter under which a prosperous government was maintained for many years. After the death of Henry Clay he became president of the American Colonization Society. His *History of Maryland in Liberia* was published in 1885. Some of his writings relating to local history have a permanent value, as, his *Life of Charles Carroll*, *Personal Recollections of the Baltimore and Ohio Railroad*, and *History of Mason and Dixon's Line*.—His son, Ferdinand Claiborne (1833—), was born in Baltimore, was admitted to the bar in 1860, was chosen seven times Mayor of Baltimore, and was repeatedly sent to the Maryland Legislature, serving twice as Speaker of the House of Delegates. He was always, whether in office or out of office, a prominent factor in the political affairs of his native city and State.

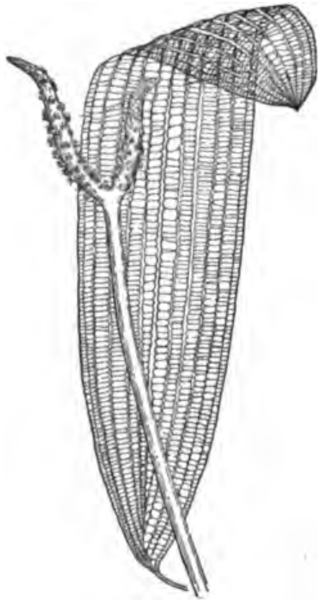
LATRUN'CULI (Lat. nom. pl., pawns, freebooters, diminutive of *latro*, robber). An ancient Roman game, played on a board divided into squares by ruled lines with men of different colors. The name properly denotes the men, and then the game. The details of play are unknown, but it is certain that one object of each player was to capture his opponent's pieces by inclosing them between two of his own men. A similar game was known to the Egyptians, and boards and sets of men, with animals' heads, have been found in tombs of that country. A similar board has been found in the Mycenæan palace at Cnosus, in Crete. The Greeks also had two games (*πεττεία*, *petteia*) played with men, one the game of 'five lines,' the other called 'cities'; the men were called 'dogs.' It seems likely that while some of the games were purely games of skill, analogous to draughts and chess, in other varieties dice were used, as in backgammon. The *latrunculi* were very popular, and are frequently alluded to in ancient writers.

LATTEN (OF. *laton*, Fr. *laiton*, from Sp. *lata*, lath, Port. *lata*, tin-plate, from OHG. *lata*, *latta*, Ger. *Latte*, Eng. *lath*; connected with Ir. *slath*, Bret. *laz*, rod, and with Ger. *Laden*, shutter). A term applied to a mixed metal made of copper and zinc, and practically the same as sheet brass. There are three varieties of latten known —*black*, *shaven*, and *roll*. The first is rolled brass about the thickness of ordinary pasteboard, and unpolished; the second is as thin as writing-paper; and the third is either of the other kinds polished on both sides. The term is now seldom used, and is restricted to brass worked into ornaments for ecclesiastical purposes.

LATTER-DAY PAMPHLETS. Violent and radical political tracts by Thomas Carlyle (1850), in which he attacked not only abuses, but also the chief institutions and humanitarian measures of the British Government.

LATTER-DAY SAINTS. See Mormons.

LATTICELEAF (OF., Fr. *lattis*, from *latte*, Ger. *Latte*, lath), Laceleaf, Water-Yam, or Ouvirandrano, *Aponogeton fenestrale*. A curious Madagascar aquatic plant, the older leaves of which seem to lose all their green tissue and to leave only the skeleton of the leaf. It is referred by some botanists to the natural order Aponogetonaceæ, nearly allied to Naiadaceæ, with which it was formerly classed. It has a light-brown edible rootstock, about the thickness of a man's thumb, 6 to 9 inches long, often branching, internally white and farinaceous. The crown of the plant is under water, and the leaves float just below the surface; the flowers, arranged in forked spikes, rise above it. The young leaves, while in the bud, are not lattice-like. There are about a dozen species in this genus, which occurs in Africa, Asia, and Australia.



LATTICELEAF.

LATTMANN, lät'mån, Julius (1818-98). A German educator, born at Goslar. He studied theology and philology at the University of Göttingen. From 1847 to 1870 he was a teacher in the gymnasium at Göttingen; from 1870 to 1890 director of that at Clausthal. Besides many schemes for linguistic reforms, he also published a number of school text-books, among them: *Kombination der methodischen Principien im lateinischen Unterricht* (1882-88); *Cornelii Nepotis Liber Emendatus et Suppletus* (1889); *Ausgleichende Lösung der Reformbewegungen des höheren Schulwesens* (1889).

LATUDE, lȧ'tụd', Henri Masers de (1725-1805). A prisoner in the Bastille, born at Montagnoc in Gascony. He learned the business of an apothecary, served in the army, and came to Paris, where he lived for some time in great poverty. In 1749 Latude informed Mme. de Pompadour that an attempt would be made upon her life through poison in a package. He did not tell that he himself was the sender of the package. Mme. de Pompadour found him out, refused to see the humor of the situation, and sent him to the Bastille. Thrice escaped, he was thrice taken, and spent twenty-eight years in prison. Malesherbes brought about his release in 1777, but he was again arrested, charged with robbery and kept in the Bicêtre till 1784, when he was freed through the intercession of Mme. Legros. During the early years of the Revolution Latude was very popular in the character of a victim of the old régime. In 1793 the Convention compelled the heirs of Mme. de Pompadour to pay him 60,000 francs damages. In 1791-92 Thierry published *Le despotisme dévoilé, ou mémoires de Latude*, which attained great notoriety.

LA′TUS REC′TUM (Lat., straight side). In mathematics, the latus rectum of a conic section is the double ordinate of a focus, or the focal chord parallel to the directrix. Its length in the ellipse and hyperbola (q.v.) is $\frac{2b^2}{a}$ and in the parabola $y^2 = 4px$ it is $4p$, or twice the distance of the focus from the directrix. See PARAMETER.

LAUBAN, lou′bän. A town in the Province of Silesia, Prussia, on the Queis, at the converging of three railway lines, 40 miles west-southwest of Liegnitz (Map: Prussia, F 3). It has a fourteenth-century convent, a lyceum, and a municipal library. Its industries include woolen, linen, and cotton weaving, bleaching, and the manufacture of earthenware. Population, in 1900, 13,792. Lauban is mentioned as early as the tenth century, and once belonged to the league of the six towns of Lusatia.

LAUBE, lou′be, HEINRICH (1806-84). A German novelist and dramatic author. He was born at Sprottau in Silesia, and, after studying theology at Halle and Breslau, made his home at Leipzig. He aroused the hostility of the Government by his participation in the liberal movement of the time, and in 1834 was expelled from Saxony and served a term of imprisonment at Berlin. After marrying, getting once more into prison, and traveling through France and Algeria, he returned to Leipzig in 1839. He was a member of the Frankfort National Assembly (1848-49), and in 1849 became director of the Burg Theatre at Vienna, a position which he held till 1867. After a short sojourn at Leipzig (1869-70), he returned to Vienna and acted as director of the Stadt Theatre till 1879. The first period of his literary career was marked by the rapid output of novels dealing with the history of Germany, as well as with contemporary social and political conditions. He also published essays and books of travel. After 1845 his attention was directed chiefly to the stage. His plays are well wrought and cleverly written, and show a remarkable mastery of the technique of the stage. Of his novels, the most important are: *Das junge Europa* (1833-37); *Das Glück* (1837); *Der Prätendent* (1842); *Die Gräfin Chateaubriand* (1843); *Der deutsche Krieg* (1863-66); *Die Böhminger* (1880); *Louison* (1884). On the stage he first attained a reputation with his tragedy *Monaldeschi* (1845), and the comedy *Rokoko* (1846). These were followed by *Struensee* (1847), *Gottsched und Gellert* (1847), *Die Karlsschüler* (1847), *Graf Essex* (1856), *Montrose* (1859), *Böse Zungen* (1868), and *Demetrius* (1872); the last was an attempt at completing Schiller's unfinished drama of that name. His works were published at Vienna in 16 volumes (1875-82). Consult Gottschall, "Heinrich Laube," in *Unsere Zeit*, vol. ii. (1884).

LAUD, WILLIAM (1573-1645). Archbishop of Canterbury, the upholder of Church authority in the time of Charles I. He was the son of a clothier in good circumstances, and was born at Reading, in Berkshire, October 7, 1573. He entered Saint John's College, Oxford, in 1589, became a fellow in 1593, and took his degree of M.A. in 1598. Ordained a priest in 1601, he soon made himself conspicuous at the university by his antipathy to Puritanism; but, being then a person of very little consequence, he only succeeded in exciting displeasure against himself. Yet his learning, his persistent and definite ecclesiasticism, and the genuine unselfishness of his devotion to the Church, soon won him both friends and patrons. In 1607 he was preferred to the Vicarage of Stanford, in Northamptonshire, and in 1608 obtained the advowson of North Kilworth in Leicestershire. In 1609 he was appointed rector of West Tilbury, in Essex; in 1611, in spite of strong opposition, president of Saint John's College, Oxford; in 1614, Prebendary of Lincoln; and in 1615, Archdeacon of Huntingdon. King James now began to show favor to Laud, and in 1616 made him Dean of Gloucester. In 1617 Laud accompanied his sovereign to Scotland, with the view of introducing episcopacy into the Church government of that country, but the attempt failed. In 1621 he was consecrated Bishop of Saint David's. After the accession of Charles I. he was translated from the See of Saint David's to that of Bath and Wells (1626), became high in favor at Court, was more than ever hated by the Puritans, and was denounced in Parliament. In 1628 he was made Bishop of London. After the assassination of Buckingham Laud became virtually the chief minister of Charles, and undertook to carry out the policy which he believed to be right with great firmness and persistency. It was not in accord with the spirit of the times, however, or suited to the temper of the people. In 1630 he was chosen chancellor of the University of Oxford, the centre of High-Church loyalty. From this period he was for several years busily but fruitlessly employed in trying to repress Puritanism. In the High Commission and Star Chamber courts the influence of Laud was supreme; but the penalty he paid for this influence was the hatred of the English Parliament and of the people generally. In 1633 he was raised to the Archbishopric of Canterbury, and in the same year was made chancellor of the University of Dublin. The famous ordinance regarding Sunday sports, which was published about this time by royal command, was believed to be drawn up by Laud, and greatly increased the dislike felt toward him by the Puritans. His minute alterations in public worship, his regulations about the proper position of the altar and the fencing of it with decent rails, his forcing Dutch and Walloon congregations to use the English liturgy, and all Englishmen to attend the parish church where they resided, are characteristic of his principles and policy. During 1635-37 another effort was made by him to establish episcopacy in Scotland; but the first attempt to read the liturgy in Saint Giles's Church, Edinburgh, excited a dangerous tumult. (See GEDDES, JENNY.) Proceedings were finally taken against him, and on March 1, 1641, he was, by order of the House of Commons, conveyed to the Tower. After being stripped of his honors, and exposed to many indignities and much injustice, he was finally brought to trial before the House of Lords, November 22, 1643, on a charge of treason and other crimes. The Lords, however, did not find him guilty; but the Commons had previously resolved on his death, and passed an ordinance for his execution. To this the Upper House gave its assent; and, in spite of Laud's producing a royal pardon, he was beheaded, January 10, 1645. Laud had a genuine regard for learning, and enriched the University of Oxford, in the course of his life, with 1300 MSS. in different European and Oriental languages. His writings are few. Wharton published his *Diary* in 1694; and during 1857-60 Parker, the Oxford publisher, issued *The Works of the Most Reverend Father in God, William Laud, D.D., sometime Lord Archbishop of Canterbury*. Consult his biography, by Benson (London, 1887; new ed. 1897); by Simpkinson (London, 1894); and by Hutton (London, 1885).

LAU'DANUM (variant of *ladanum*, from Lat. *ladanum, ledanum*, from Gk. λήδανον, *lēdanon*, resinous juice or gum of a certain shrub, from *λῆδον*, *lēdon*, mastich, from Pers. *lādan*, sort of shrub), or TINCTURE OF OPIUM. A fluid preparation of opium, made by macerating the sliced or powdered drug in alcohol and filtering the resultant. It is of a deep brownish-red color, and possesses the peculiar nutty odor and smell of opium. Formerly it was a preparation of uncertain strength, as there was no definite rule for compounding it. But the United States Pharmacopœia of 1880 prescribed that it (together with all other fluid preparations of opium except paregoric) should be made of such strength that ten minims of it should represent one grain of opium. It is a powerful analgesic and hypnotic, but it causes constipation, headache, and occasionally nausea. It is too frequently used as a domestic medicine for the relief of pain, especially in cases of cramps or diarrhœa, when in the majority of cases a brisk cathartic should be used. To young children it must be given with extreme caution, as fatal results have followed a very small dose administered to an infant for relief of supposed pain, or as a 'soothing' agency. The drug is used in widely varying doses in adults, according to the indications, as interpreted by the physician. See ANTIDOTE; OPIUM.

LAU'DER, ROBERT SCOTT (1803-69). A Scotch historical and portrait painter. He was born near Edinburgh, June 25, 1803; studied painting under the patronage of David Roberts and Sir Walter Scott at the Trustees' Academy, Edinburgh, and in London, after which he spent five years in Italy. From 1838 to 1849 he resided in London, and after that time until his death, April 22, 1869, in Edinburgh. His best works were scenes from Scott's novels. His "Christ Teaching Humility" was purchased by the Scottish Association for the Encouragement of Art, and placed in the Scottish National Gallery at Edinburgh, which also contains his "Sentinels," and two of his portraits.

LAUDER, Sir THOMAS DICK (1784-1848). A Scottish author, eldest son of Sir Andrew Lauder, sixth Baronet of Fountainhall, Haddingtonshire, Scotland. For a short time he served in the Seventy-ninth Regiment (Cameron Highlanders). On the death of his father, in 1820, he succeeded to the baronetcy. For several years he was secretary to the Board of Scottish Manufacturers, and to the Board of White Herring Fishery. He became known as the author of several romances written in imitation of Scott: *Simon Roy* (1817), *Lochindhu* (1825), and *The Wolf of Badenoch* (1827). The scenes of the last two are laid in Morayshire, just before the wars of Bruce. Later in life he published *Highland Rambles and Legends* (3 vols., 1837), and *Legends and Tales of the Highlands* (3 vols., 1841). His only work now read is the *Account of the Great Moray Floods of 1829* (1830). This has survived for its graphic descriptions, its humor and pathos. He died May 29, 1848. A series of papers written during the last two years of his life for *Tait's Magazine*, and entitled *Scottish Rivers*, was edited with a preface by Dr. John Brown (Edinburgh, 1874).

LAUDER, WILLIAM (?-1771). A Scotch Latinist and impostor. He was educated at Edinburgh University, and became a tutor, but was unsuccessful in several attempts to obtain a collegiate appointment. He was a good Latin scholar, and published *Poetarum Scotorum Musæ Sacræ* (2 vols., 1739), a collection of Latin poems by Arthur Johnston, Ruddiman, Ker, and others, the circulation of which, however, was damaged by Lauder's injudicious praise of Johnston. He went to London, where he supported himself by teaching and literary work. In 1747 he commenced the series of articles in the *Gentleman's Magazine* by which he is remembered, owing to his indictment of Milton for plagiarism. By his quotations and plausibility he deceived even Dr. Johnson, and received subscriptions for the publication of an *Essay on Milton's Use and Imitations of the Moderns in His "Paradise Lost"* (1750), to which Dr. Johnson wrote a preface and postscript. The publication of a more extended work on the subject was arrested by John Douglas, afterwards Bishop of Salisbury, who exposed Lauder's fraud in citing excerpts from Alexander Hog's Latin translation of *Paradise Lost*, as plagiarisms of Grotius, Masenius, Staphoristius, and others. Dr. Johnson obtained Lauder's confession of the forgery, notwithstanding which Lauder continued his attack on Milton and published *The Grand Impostor: or King Charles I. Vindicated from the Charge of Plagiarism Brought Against Him by Milton, and Milton Himself Convicted of Forgery* (1754). Lauder was finally obliged to emigrate to Barbados, where he died in poverty.

LAU'DERDALE, JAMES MAITLAND, eighth Earl of (1759-1839). A Scottish statesman and author, born at Ratho, Midlothian. He was educated at the University of Edinburgh, studied also at Trinity College, Oxford, and at Glasgow, read law at Lincoln's Inn, London, and became advocate in 1780. In that year he was also returned to the House of Commons for Newport, Cornwall. From 1784 to 1789 he sat for Malmesbury, in 1787 was appointed a manager for the conduct of the impeachment of Warren Hastings, and in 1790 was elected a representative peer of Scotland. While a member of the Commons, he spoke against the persons who were responsible for the American war. He was strongly opposed to the French war, and is said to have made his appearance in the Lords on one occasion in the garb affected by the Jacobin organization. His attitude toward the Ministry prevented his reëlection in 1796 and 1802, but in 1806 he became a peer of Great Britain and Ireland (Baron Lauderdale of Thirlestane, Berwick), Lord High Keeper of the Great Seal of Scotland, and a member of the Privy Council. He resigned in 1807, was long prominent in the opposition in the House of Lords, and the leader of the Scottish Whigs. Ultimately, however, he became a Tory. His attack (with the Duke of Bedford) on the pension of Burke was answered by Burke in the well-known *Letter to a Noble Lord* (1796). His writings include an *Inquiry Into the Nature and Origin of Public Wealth* (1804; second enlarged edition, 1819; translated into Italian and French) and a considerable list of pamphlets.

LAUDERDALE, John Maitland, Duke of (1616-82). A Scotch statesman, the grandson of John, first Lord Thirlestane, brother of the famous Secretary Lethington, and son of John, first Earl of Lauderdale, and of Isabel, daughter of Alexander Seaton, Earl of Dunfermline and Chancellor of Scotland. He was born at the ancient family seat of Lethington, May 24, 1616. He received an excellent education, was carefully trained in Presbyterian principles, and entered public life as a keen Covenanter. In 1643 he attended the Westminster Assembly of Divines as an elder of the Church of Scotland, and was a party to the surrender of Charles I. to the English army at Newcastle. Shortly after, however, he changed his politics, and became a Royalist. When Charles II. came to Scotland from Holland, Lauderdale accompanied him, but, being taken at the battle of Worcester in 1651, was kept a prisoner for nine years. Set at liberty by General Monk in 1660, he hastened to The Hague, and was warmly received by Charles. After the removal of Middleton in 1662, and of Rothes in 1667, Lauderdale was practically the sole ruler of Scotland, and for some time displayed a spirit of moderation and an apparent regard for the religious feelings of his countrymen; but he soon became a bitter persecutor of the Covenanters. In 1762 Charles showed his appreciation of Lauderdale's conduct by creating him Marquis of March and Duke of Lauderdale; two years afterwards he was raised to the English peerage as Viscount Petersham and Earl of Guilford, and received a seat in the English Privy Council. He was one of the famous 'cabal'; but, by his domineering arrogance, excited the disgust and hatred of his colleagues, as well as of the nation, fell into disgrace, was stripped of his offices and pensions in 1682, and died at Tunbridge Wells, August 24 of the same year. Consult the articles by Airy in the *Quarterly Review*, vol. clvii. (London, 1884), and in the *English Historical Review*, vol. i. (London, 1886); and a selection from the 36 vols. of Lauderdale MSS. in the British Museum, edited for the Camden Society in 3 vols. (London, 1884-85).

LAUD'IAN MANUSCRIPT (Codex Laudianus). A valuable manuscript of the Acts of the Apostles, named after Archbishop Laud, who in 1636 presented it to the University of Oxford. It has in parallel columns and uncial letters the Greek text with a closely literal Latin version, different both from the Vulgate and from Jerome's. The Latin words are always exactly opposite the Greek. The portion from xxvi. 29 to xxvii. 26 has been lost. The vellum is inferior and the ink pale. It was probably written in the west of Europe and about the sixth century. It is now in the Bodleian Library, and is numbered 35. It was published by Thomas Hearne (Oxford, 1715).

LAUDON, lou′dôn, or **LOUDON,** Gideon Ernst, Baron von (1717-90). An Austrian general, born at Tootzen, Livonia, of an old Scotch family. After serving in the Russian army he went to Austria in 1742, and rose to be colonel at the outbreak of the Seven Years' War. Within a year his services raised him to the rank of major-general. He was present at the battles of Rossbach and Hochkirch, and in 1759 his forces with those of the Russian General Soltikoff overwhelmed the army of Frederick the Great at Kunersdorf. He won further victories at Glatz and Landshut. He became baron (1758) and Aulic Councilor (1766). In 1769 he was commandant-general in Bohemia, and in 1778 became field-marshal. In the Turkish War of 1788-89 he captured Belgrade. In 1790 he was made generalissimo.

LAUDONNIÈRE, lô′dô′nyâr′, René de (?-c.1586). A French navigator of the sixteenth century. In 1562 he was with Ribaut (q.v.) when the latter made his unsuccessful attempt to establish a Huguenot colony at Port Royal in South Carolina, and two years later was dispatched at the head of a second expedition to the New World. On June 25, 1564, he arrived off the mouth of the Saint John's River, Florida, and, sailing up the river for a distance of five miles, began the erection of a fort, which he named Caroline, in honor of Charles IX. Laudonnière's management involved the colonists in quarrels with the Indians, upon whom they were dependent for supplies. Some of the number, mostly impoverished gentlemen, who resented the hard labor to which they were put, revolted against the rule of their leader, and forced him to sanction a marauding expedition to pillage the Spanish settlements in Cuba. Affairs went from bad to worse, and the colony was threatened with destruction for want of food. On August 3, 1565, Capt. John Hawkins, the celebrated English slaver and privateer, arrived off the mouth of the river and supplied the colonists with provisions, selling them also one of his ships, on which Laudonnière intended to return to France. On August 29th Jean Ribaut arrived with seven ships and some 300 men, and superseded Laudonnière in the command, the latter being ordered home to defend himself against accusations of tyranny and treason. His departure for France was delayed by the appearance of a Spanish fleet under Menendez de Avilés, which had been dispatched for the purpose of driving out the French. On September 10th Ribaut set out in his ships to attack the Spaniards at Saint Augustine, leaving Laudonnière in command at the fort. About ten days later Menendez de Avilés stormed the fort, and a massacre of the colonists ensued. Laudonnière succeeded in effecting his escape. With the rest of the survivors of the massacre he was rescued by the remnant of the French fleet. He went to England, and did not return to France until 1566. Twenty years later he published *L'histoire notable de la Floride, contenant les trois voyages faites en icelle par des capitaines et des pilotes* *français*, translated in Hakluyt's *Principal Navigations* (1589), and in French's *Historical Collections of Louisiana*. The last-named book also contains other original documents relating to this episode, which is fully treated in Parkman, *Pioneers of France in the New World* (Boston, 1865). See Menendez de Avilés; Ribaut.

LAUENBURG, lou'*e*n-bōōrk. A circle in the Province of Schleswig-Holstein, Prussia. Its area is 455 square miles; its population, in 1900, 51,833. The district is productive and well forested. Agriculture and cattle-raising are the chief industries. There are numerous lakes. Lauenburg was inhabited by Slavic tribes when Charles the Great conquered it in 804. It formed part of the Duchy of Saxony, and in the thirteenth century became a separate State, ruled by the dukes of Saxe-Lauenburg. This line became extinct in 1689, when a number of princes contested the succession. Finally, in 1702, Lauenburg acknowledged the dominion of the Elector of Hanover. In the course of the Napoleonic wars it passed to France. In 1815 Denmark obtained possession of it, but had to cede it to Prussia and Austria after the War of 1864. By the Convention of Gastein of 1865, Austria gave full possession to Prussia, and the latter has possessed it since that time. In 1890, when Bismarck retired from office, William II. conferred upon him the title of Duke of Lauenburg. Bismarck's main estate (Friedrichsruh) is within the limits of the old duchy. The town of Lauenburg, founded in 1811, is situated on the Elbe, 25 miles southeast of Hamburg. Its population, in 1900, was 5346.

LAUENBURG. A town in the Province of Pomerania, Prussia, situated on the Leba, 38 miles west-northwest of Danzig (Map: Prussia, G 1). There are manufactures of woolen and linen cloth, and of white and common leather, matches, machinery, and spirits. Population, in 1900, 10,436.

LAUGÉE, lō'zhȧ', Désiré François (1823-96). A French painter, born at Maromme, Seine-Inférieure, pupil of Picot and of the Ecole des Beaux-Arts. After a visit to Belgium and England, he began to exhibit portraits and historical genre scenes, turned from romantic subjects to delineations of popular life, and subsequently produced a number of religious paintings for churches. Among his most noteworthy works are: "Assassination of Rizzio" (1849, Amiens Museum); "Death of Zurbaran" (1850); "Lesueur with the Carthusian Monks" (1855, Luxembourg Museum); "Saint Louis Washing the Feet of the Poor" (1863, Ministry of State); "Baptism of Clovis," and "Saint Clotilde Helping the Poor" (1870), mural paintings in the Church of Saint Clotilde, Paris; "Candle of the Madonna" (1877, Luxembourg); "Triumph of Flora" (1879), decorative painting in the Hôtel Continental, Paris; "The Servant of the Poor" (1880, Lille Museum); "Victor Hugo on His Deathbed" (1886); "Palm Sunday" (1892); "Martyrdom of Saint Denis," mural painting in the Church of the Trinity; besides several decorative works in other churches and in the Exchange in Paris. He was awarded medals in 1850, 1855, 1859, 1861, and 1863, and decorated with the Legion of Honor in 1865.—His son and pupil, Georges (1853—), is a genre painter, who studied also under Pils and Henri Lehmann, and whose works include such subjects as "Repast of the Mowers" (1877), "Poor Blind Man" (1881), and "The First-Born" (1883).

LAUGEL, lō'zhĕl', Auguste (1830—). A French author, born in Strassburg. For several years he was a mining engineer, and afterwards became secretary to the Duc d'Aumale. His works, on scientific, historical, and philosophical subjects, include: *Etudes scientifiques* (1859); *Science et philosophie* (1862); *Les Etats-Unis pendant la guerre* (1861-65); *L'Angleterre politique et sociale* (1873); *Grandes figures historiques* (1875); *Lord Palmerston et Lord Russell* (1876); *Louis de Coligny* (1877); *La France politique et sociale* (1877); and *Henri de Rohan, son rôle politique et militaire sous Louis XIII.* (1889).

LAUGERIE BASSE, lōzh'rā' bȧs. A famous prehistoric station in the valley of the Vézère, Dordogne, France. From this station came the human remains forming the type of the Laugerie Basse race, a long-headed people living in France in the Magdalenian epoch, near the close of the Quaternary. Consult: Deniker, *Races of Man* (London, 1900); Mortillet, *Le préhistorique* (Paris, 1900).

LAUGHING-GAS. See Nitrogen; Anæsthetics.

LAUGHING GULL. A rather small American gull (*Larus atricilla*), so called from its hallooing cry. It is gray on the back and white beneath, with the head black in mature summer plumage, and the feet reddish. Its home is in the tropics, from the Amazon northward; but in summer it strays up both coasts of America to Maine and central California. It is very numerous on the South Atlantic and Gulf coasts, breeds on sandy islets and beaches from the Carolinas southward, and rarely goes inland. Consult Coues, *Birds of the Northwest* (Washington, 1874).

LAUGHING-JACKASS, or Giant Kingfisher. The great brown kingfisher (*Dacelo gigas*) of Australia, about 17 inches long, and mostly brown in color. It represents the subfamily Halcyoninæ, which differs from the true kingfishers most markedly in that it does not frequent waters or feed on fish, but preys on beetles, reptiles, and small mammals, and is of great use in preventing the excessive multiplication of reptiles and other pests. It is a common bird in Australia, and has received its English name from the colonists on account of its peculiar cry. It lays its eggs, which are pure white, in a cavity in an old tree, which it defends with great courage. See Kingfisher; and Plate of Kingfishers, Motmots, etc.

LAUGHING PHILOSOPHER, The. A title given to Democritus (q.v.).

LAUGHLIN, lăf'lĭn, James Laurence (1850—). An American economist, born at Deerfield, Ohio. He was graduated at Harvard with high honors in 1873; taught in Boston schools, and became instructor in political economy at Harvard in 1878, and assistant professor (1883), holding this chair until 1887, when he became president of the Manufacturers' Mutual Insurance Company of Philadelphia. In 1890 he was appointed professor of political economy at Cornell University, and in 1892 he became head of the department of political economy at the University of Chicago. He took an active part in the work of the Monetary Commission, and wrote the important report of that body. His other writings are an abridgment of John Stuart Mill's *Political Economy* (1884); *History of Bimetallism in the United States* (1885); *Elements of Political Economy* (1887); *Facts About Money* (1895).

LAUGHTER (AS. *hlĕahtor*, from *hlæhhan*, Icel. *hlæja*, Goth. *hlahjan*, OHG. *hlahhan*, *lahhan*, Ger. *lachen*, to laugh; probably imitative in origin). A form of expression (q.v.) of the pleasurable emotions. In the smile, which is probably genetically a feeble successor of the laugh, the corners of the mouth are drawn upward and backward, and the cheeks are raised, by the contraction of the great zygomatic muscles; the upper lip is slightly raised; the upper and lower eyelids are somewhat approximated by the contraction of the orbicular muscles; the eyes are brightened owing to their greater tenseness, which results from these muscular contractions or from the increased blood-pressure within the eyeball. The 'graduation' of the smile into the laugh is characterized by the enhancement and spread of the motor phenomena; the mouth is opened; there are deep inspirations, followed by short, spasmodic, expiratory movements, especially of the diaphragm; the vocal cords are contracted, giving the typical sounds of laughter. In violent, spasmodic laughter, the respiratory disturbances are increased; there are also circulatory changes (quickened pulse, congested face); glandular discharges (secretion of tears); distortions of the whole body, usually by throwing the head back and curving the trunk backward; and involuntary and purposeless movements of the limbs.

The causes of laughter are not always easy of assignment. It seems to be primarily the expression of mere joy or happiness (notably in the case of children), yet it may be incited by what seem to be purely physiological agencies, e.g. tickling, cold, hysteria, and even some kinds of acute pain. Furthermore, in the adult it is also provoked by 'the ludicrous,' and, indeed, is so far dependent upon this factor that some writers regard laughter as always and intrinsically a response to a ludicrous situation. Thus Hobbes says that laughter is "a sudden glory, arising from a sudden conception of some eminency in ourselves by comparison with the infirmity of others or with our own formerly." This may satisfactorily answer Spencer's question—"What induces us to laugh on reading that the corpulent Gibbon was unable to rise from his knees after making a tender declaration?"—but it is hard to believe that, as some assert, we laugh at the 'infirmity' or degradation of mankind when we are told that the Chinese mandarin who committed suicide by eating gold-leaf died of a consciousness of inward guilt. Still less is this proposition suited to the explanation of that laughter which is merely the indication of extreme pleasure, or abundant 'animal spirits.' To explain this, Herbert Spencer invokes the principle of 'dynamogenesis'; he reduces the display of muscular excitement to physiological conditions, in terms of the discharge of energy through the pathways of the nervous system. Laughter may be produced by strong feeling of almost any kind; its movements are purposeless, and thus symptomatic of uncontrolled nervous discharge. The overflow takes place along the easiest and most used routes, i.e. to the facial, articulatory, and respiratory muscles. The laughter at the ludicrous (which is always a '*descending* incongruity,' a drop from great to small) is similarly due to the fact that "a large amount of nervous energy, instead of being allowed to expend itself in producing an equivalent amount of the new thoughts and emotions which were nascent, is suddenly checked in its flow. . . . The excess must discharge itself in some other direction, and there results an efflux through the motor nerves to various muscles, producing the half-convulsive actions we term laughter." Darwin concludes that, in adult laughter, the person must be in a generally pleasant mood, and that usually something incongruous, unaccountable, exciting surprise, and some sense of superiority must be the cause. He finds the conditions of laughter at the ludicrous strikingly analogous to those of laughter at tickling.

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LAUGIER, lō'zhyȧ', Paul Auguste Ernest (1812-72). A French astronomer. He was born in Paris and studied at the Polytechnique and at the Observatory under Arago. He was elected member of the Academy of Sciences in 1843, and was afterwards attached to the Bureau of Longitudes. He was especially well known for his work on the sun-spots and on the solar equator; wrote *Recherches sur la rotation du soleil autour de son centre de gravité* (1841); studied the construction of a portable meridian circle; and contributed to the *Comptes rendus* of the Academy of Sciences.

LAU'MONTITE (named in honor of its discoverer, Laumont). A hydrated calcium aluminum silicate that crystallizes in the monoclinic system. It is transparent or translucent (becoming opaque and pulverulent on exposure), with a vitreous lustre that is pearly on the faces of cleavage, and white to yellowish-gray and sometimes red in color. Laumontite occurs in cavities in amygdaloid, porphyry, syenite, trap, gneiss, and sometimes in veins in clay-slate. The principal localities are the Faroe Islands, Greenland, Bohemia, Switzerland, the Hebrides, Nova Scotia, and in the United States at Phippsburg, Me., Bergen Hill, N. J., and the northern shore of Lake Superior. It is classed with the zeolites.

LAUN, loun, Friedrich. The pseudonym of the German novelist Friedrich August Schulze (q.v.).

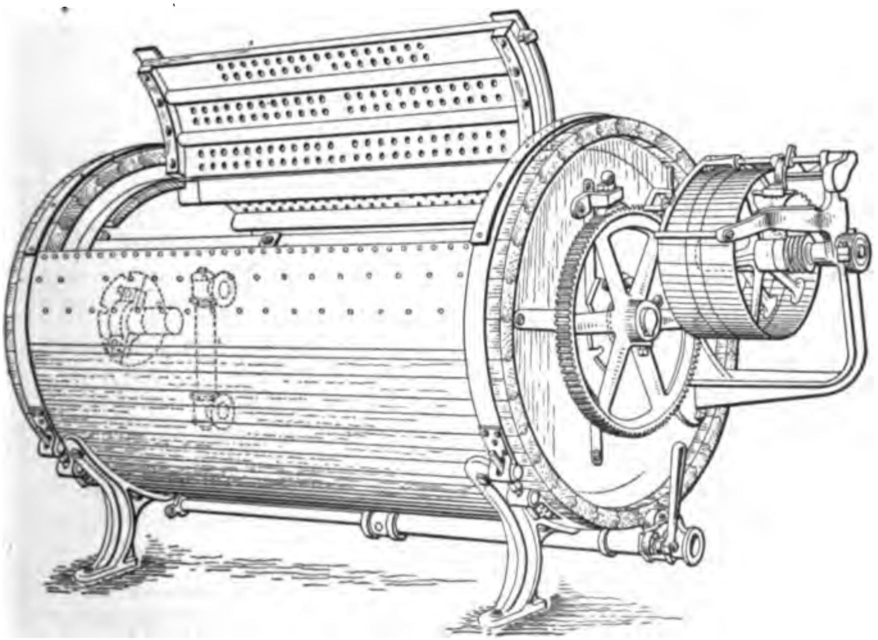
LAUNCESTON, lạn'ston *or* lŏn'son. Until 1838 the capital of Cornwall, England, on the Kensey, a tributary of the Tamar, 21 miles northeast of Bodmin (Map: England, B 6). It is a very old town, prominently associated with the history of Cromwell, and has remains of a Norman castle given by the Conqueror to the

Earls of Moreton. The town owns a fine water-supply, profitable markets, a public library, and sewage farm. Its grammar school dates from the reign of Edward VI. Population, in 1901, 4000.

LAUNCESTON. The second city of Tasmania, the capital of Cornwall County, and the chief port of entry and mart of trade for the north of the island (Map: Tasmania, D 2). It stands at the junction of the Esk with the Tamar, which, after a course of 40 miles, enters Bass Strait (q.v.) at Port Dalrymple. It is 133 miles by rail from Hobart, the capital. It is accessible to ships of considerable burden, and carries on a thriving commerce with the States of Victoria and South Australia. The United States has a resident consular agent. It owns its waterworks; was incorporated in 1858, and as a city in 1889. In the surrounding district rises Ben Lomond to the height of 4500 feet. Population, in 1891, 17,258; in 1901, 21,046, with suburbs 26,430.

LAUNCH (OF. *lanchier*, *lancier*, Fr. *lancher*, It. *lanciare*, to hurl as a lance, from Lat. *lancea*, lance). The largest boat carried by a man-of-war; there are both steam launches and sailing launches. Large launches, 40 to 60 feet long, are carried by battle-ships and large armored cruisers. They are designed for use as picket or vedette boats, to guard against surprise by torpedo-boats when operating near the enemy's coast or fleet; and they are as fast as strength and limited size permits, some steaming eighteen or nineteen knots on trial. The sailing launch is a sloop-rigged boat, also intended for rowing. She is a heavy boat, with good carrying capacity; is coppered as a rule, and is generally used, when the battalion is sent away from the ship, as the artillery boat.

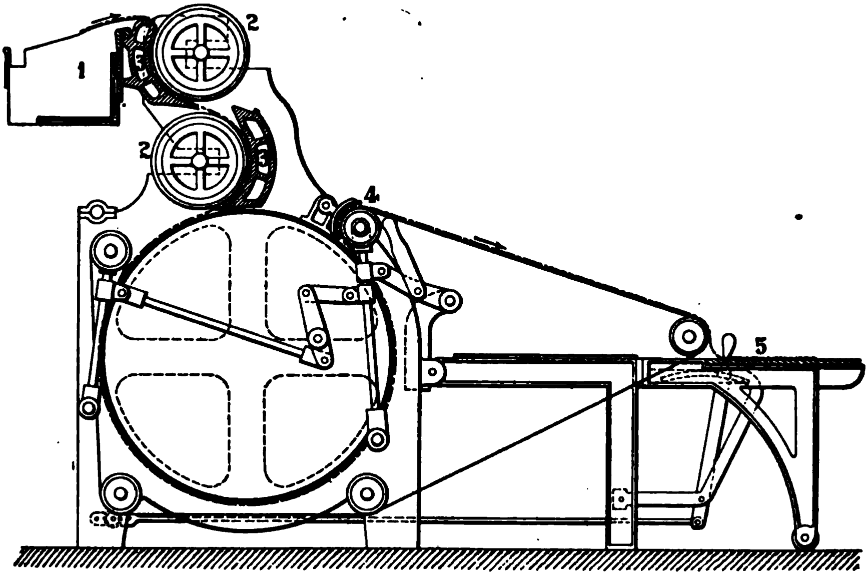
LAUNCH, LAUNCHING. The process of removing a vessel from the land to the water. The keel of a ship is laid upon a series of wooden blocks, placed 6 or 7 feet apart, and built up 3 or 4 feet from the ground, the tops of which lie in a line which slopes downward to the water at an angle of about five-eighths of an inch to the foot. The whole ship, therefore, when it is finished, slopes downward with this inclination, and rests upon the blocks just mentioned, and upon suitable timber shores. When the vessel is ready for launching, 'ways' of timber and planking are laid down parallel to the keel, and at some little distance on each side of it, under the bilges of the ship; they extend into the water a considerable distance below high-water mark. A 'cradle' is then built under the ship, of which the bottom is formed of smooth timbers resting upon the ways. Before launching, the under sides of these timbers and the upper sides of the ways are well greased, and the weight of the ship is transferred from the keel-blocks to the cradle and ways. Timbers, called 'dog-shores,' are placed so as to resist the tendency of the ship to slide down until the right moment. When this arrives, at high water, the ceremony of launching and naming the ship takes place; the dog-shores are knocked away, and the vessel glides stern foremost into the water. As soon as the water removes the weight of the vessel from the cradle, the latter breaks up into pieces. Many large battle-ships and some other vessels have been built in dry docks and *floated* out when ready, instead of being launched. This system is economical, if the dry docks are not needed for other purposes. On the Great Lakes the practice of launching ships sidewise is very common.



POWER WASHING-MACHINE.

LAUNDRY MACHINERY (from ME. *launder*, *laundere*, *lander*, washerwoman, from OF. *lavendier*, *lavandier*, washerman, from Lat. *lavandus*, gerundive of *lavare*, to wash). The mechanical appliances used in steam laundries include the wheeled truck for carrying the clothes from one machine or appliance to another, the washing machine, the drying apparatus, mechanical sprinklers, starching machines, and in addition to the mangle and ordinary ironer, a multitude of specially shaped machines for ironing sleeves, collars, and cuffs, for finishing the edges of collars and for fluting ruffles.

The quality of water used in a laundry is of great importance. If the water is hard, muddy, or colored, a special plant for softening or filtering may be necessary. A large amount of steam is required, both for motive power and for heating the water. Two general types of washers are in use, revolving and stationary. In the first the revolution of closed cylinders keeps the clothes in motion; in the second the cleansing is performed by the strokes of plungers. The boiling, rinsing, and bluing may all be performed in the washer, or in another tub. The water is heated by steam-pipes and sometimes the boiling is done under steam-pressure, in which case the boiler must be especially strong. *Drying* is effected by passing the clothes through a wringer, then placing them in a centrifugal dryer. (See DRYING-MACHINES.) The drying is sometimes done in an artificially heated drying-room. *Ironing-Machines*, though of many different forms, generally operate upon the same principle. A hard surface of polished metal, heated by steam, gas, or electricity, revolves close to a second hard surface, which is usually covered with a felt padding and a cotton sheet. On the latter surface the article to be ironed is so placed that it is brought into close contact with the hot revolving cylinder of metal, the padded cover providing for such inequalities of surface as seams and hems. The most familiar form is the *mangle*, designed for ironing sheets, towels, and other articles of uniform shape and thickness. The principle is capable of endless adaptations, however, which fits it for ironing specially shaped garments, such as shirt bosoms and bodies, cuffs, collars, and sleeves. For such pieces as require starching, there are specially constructed jacketed starch-cookers to make the starch. Various types of machine starchers are used for different-shaped articles. See Sidney Tebbutt's paper on "Steam Laundry Machinery," read in 1899 before the Institution of Mechanical Engineers of Great Britain, and reprinted in *Cassier's Magazine* (London and New York) for February, 1899.



SECTIONAL VIEW OF MANGLE.
1. Feed-Box. 2. Cover-Rolls. 3. Steam-Closets. 4. Scraper. 5. Discharging Table.

LAUNE, or **LAULNE**, lōn, ETIENNE DE (1518-c.1595). A French Renaissance engraver, born in Paris, or perhaps at Orleans. He was a goldsmith and medalist, probably a pupil of Cellini, during the early part of his career. Afterwards he joined the Reformers and spent the remainder of his life at Augsburg and then at Strassburg, where he died. About 1560 he took up engraving and executed several plates after pictures by the Fontainebleau School. He also made some copies of prints by Raimondif. Owing probably to his training as a medalist, his prints are all small and highly finished. His designs for goldsmith's work include medals, money, jewelry, and plate; some of these are still to be seen at the Louvre. Androuet du Cerceau was a pupil of De Laune.

LAUN'FAL, SIR. A knight of the Round Table and steward of King Arthur. His story is the subject of a metrical romance by Thomas Chestre in the time of Henry VI., and his name appears in James Russell Lowell's *Vision of Sir Launfal.*

LAUNITZ, lou'nits, ROBERT EBERHARD (1806-70). A Russian-American sculptor, born in Riga, Russia. He was the pupil of his father, also a sculptor, and studied under Thorwaldsen in Rome. He emigrated to America about 1828, and settled in New York City, where he became a N.A. in 1833. His works include the battle monument in Frankfort, Ky.; the Pulaski monument at Savannah, Ga.; the monument to Gen. George H. Thomas at Troy, N. Y.; and some monuments in Greenwood Cemetery, Brooklyn, N. Y.

LAU'RA (Gk. λαύρα, alley, cloister; possibly connected with Lat. *lura*, mouth of a bag, or with Lith. *lerwas*, narrow stream between high banks). A name given to a collection of cells in a desert, differing from a monastery, in which the monks all lived together. Each monk in the laura had his own cell, and for five days of the week lived alone, his only food being bread and water. On the other two days the monks assembled to receive communion, after which they joined in a light repast. They were subject to severe rules. A meagre diet, silence, and solitude were required. The most celebrated lauras mentioned in ecclesiastical history were in Palestine, as the Laura of Saint Enthymus, four or five leagues from Jerusalem; the Laura of Saint Saba, near the brook Kidron; and the Laura of the Towers, near the Jordan. The first seem to have been founded by Saint Charito, of which the oldest is that afterwards known as the Laura of Pharan by the Dead Sea.

LAURA (?-1348). The lady celebrated in Petrarch's poems. She is continually mentioned with such definiteness as to make impossible the suggestion of Boccaccio that she was a mere idealized abstraction. D'Ovidio ("Madonna Laura" in *Nuova Antologia*, 3d ser., 16, 1888, pp. 209-33, 377-406) showed further that Laura was no poetic pseudonym to hide some other name, because of Petrarch's frequent play on the word. In his *Mémoires pour la vie de Petrarque* (Amsterdam, 1764-67) the Abbé de Sade set forth the claim of his ancestor, Laura de Sade, *née* de Noves, to be identified with her. Like Petrarch's Laura, she died April 6, 1348, and was, it seems, buried on the same day (as she died of the plague), and in the Franciscan Church. Besides, both were married and had many children—Petrarch says eleven. The identification is fairly well established. Much has been written in the attempt to prove it by cipher references to 'de Sade,' 'di Sado,' or 'de Noves.' Consult: Cesareo, "Gli Amori di Petrarca," *Giornale Dantesco*, 8, 1900, pp. 1-21, and Sicardi, "Attorno al Petrarca e a Laura," *Rivista d'Italia*, 3, pt. 3, 1900.

LAURA'CEÆ (Neo-Lat. nom. pl., from Lat. *laurus*, laurel), THE LAUREL FAMILY. A natural order of dicotyledonous plants, consisting of trees or shrubs, many of which are evergreen. The leaves are without stipules; flowers in panicles or umbels; perianth is 4 to 6 cleft; stamens twice as many as the perianth segments and opposite them; fruit a one-seeded berry or drupe; fruit-stalk often enlarged and fleshy. This order contains about 40 genera and 1000 species, mostly tropical, the greatest number occurring in Southeastern Asia and in Brazil. The laurel (q.v.) is the only European genus. An aromatic and fragrant character pervades the order, which includes cinnamon, cassia, and other aromatic plants. Some species are valuable for their timber, as greenheart; some for their medicinal barks, as greenheart (bebeeri) and sassafras; some for their secretions, of which camphor is the most important; some for their fruit, as the avocado pear (q.v.). A few very remarkable species, tropical climbing parasites like dodder, forming the genus Cassytha, have been united with this order by many botanists, although others separate them as a distinct order. The classification and principal genera, according to Pax, is: Persoideæ, represented by Cinnamomum, Persea, Sassafras, and Litsea; and Lauroideæ, with Cryptocarpa, Lindera, Laurus, and Cassytha as the chief genera. Of these Persea, Sassafras, Litsea, and Lindera are indigenous to the United States. See Colored Plate of CALIFORNIA SHRUBS for illustration of California Laurel (Umbellularia Californica).

LAURANA, lou-rä'nȧ, LUCIANO DA. An Italian architect of the Early Renaissance. The dates of his birth and death are unknown, but there is record of his activity as a builder between 1468 and 1482. His name is derived from his birthplace in Dalmatia, and he was, perhaps, a pupil of Bruneleschi. His most important works, the ducal palaces at Urbino and Gubbio, were executed for Federigo of Urbino. He excelled his immediate contemporaries in the simplicity and nobility of his proportions, his work being hard to distinguish from that of his pupil Bramante (q.v.).

LAUREATE (Lat. *laureatus*, from *laurea*, laurel-tree, from *laurus*, laurel), POET. A title received from the English Crown by letters patent. There is no installation ceremony, but the newly appointed laureate is expected to attend a levee in Court dress. It was formerly his duty to compose an ode on the sovereign's birthday, on the birth of a royal infant, on a national victory, and by request on many other occasions. The origin of the title has given rise to much speculation. It was customary among the Greeks to crown with the laurel a popular poet, and the practice was revived in the Middle Ages. Petrarch, for example, was crowned with great solemnity at Rome (1341). At Paris, Oxford, and Cambridge, the laurel wreath was sometimes placed on the heads of scholars distinguished for learning or poetry. John Skelton (died 1529) received the honor from both the English universities, and accordingly styled himself *Poeta Laureatus*. Attached to the households of the mediæval English kings were minstrels and poets. They were not, however, crowned; instead of this honor, they received pensions. Chaucer received from Edward III. a pension of twenty marks (1366), and afterwards (1374) a pitcher of wine daily—one of the subsequent perquisites of the laureateship. But Chaucer never received an official appointment to the post, and his pensions were for diplomatic and other services. There was no English poet laureate till the accession of the House of Stuart. By virtue of his pensions in 1616 and 1630, Ben Jonson came to be regarded as laureate; but the title, so far as is known, was never officially conferred on him. On December 11, 1638, William D'Avenant received from Charles I. a pension of £100 a year, but no title accompanied the grant. He was, however, assumed to be laureate, especially after the Restoration. So far as is known, the first English poet to receive the title of poet laureate by royal letters patent was John Dryden. The honor was conferred on him August 18, 1670. Dryden's successors, with their terms of office, are: Thomas Shadwell (1689-92), Nahum Tate (1692-1715), Nicholas Rowe (1715-18), Laurence Eusden (1718-30), Colley Cibber (1730-57), William Whitehead (1758-85), Thomas Warton (1785-90), Henry James Pye (1790-1813), Robert Southey (1813-43), William Wordsworth (1843-50), Alfred Tennyson (1850-92), Alfred Austin (1896—). Consult: Malone's essay prefixed to *Works of Dryden* (London, 1800); Hamilton, *The Poets Laureate of England* (ib., 1879); and West, *The Laureates of England* (ib., 1895).

LAUREL (from OF., Fr. *laurier*, Prov., Sp. *laurel*, from Lat. *laurus*, laurel), *Laurus*. A genus of Lauraceæ, which, as now restricted, contains only a few species, the principal ones being the noble laurel, victor's laurel (*Laurus nobilis*), and sweet bay (*Laurus canariensis*), natives of Asia Minor, but widely diffused in the Mediterranean region, often bushes of 15 feet or less, but sometimes trees of 30, or even 60 feet high. The former has rather large, lanceolate, leathery, shining leaves, reticulated with veins, and axillary clusters of yellowish-white flowers of no beauty. The fruit is oval, bluish-black, and about half an inch long. The leaves and the fruit, which are bitter, astringent, and agreeably aromatic, were formerly much used in medicine as a stomachic and stimulant; but are almost out of use. The leaves, however, are sometimes used in cookery for flavoring. They contain a volatile oil (*oil of sweet bay*) and a bitter, gummy extractive. By the ancient Greeks the laurel was called daphne, and was sacred to Apollo. Berry-bearing twigs of it were wound round the foreheads of victorious heroes and poets; and in later times the degree of doctor was conferred with this ceremony, whence the term laureation. The noble laurel is common in shrubberies, but not nearly so common as the cherry-laurel (q.v.).

A LAUREL (*Laurus*).

Fossil forms of the genus Laurus, and its close allies, Cinnamomum, Sassafras, and Benzoin, have been found abundantly in the Cretaceous and Tertiary rocks of North America and Europe, where they have been recognized by the fossil leaves, flowers, and fruits. It is of interest to note that the fossil species, which resemble closely those modern representatives that grow in warm climates, are found in large numbers in such high northern latitudes as Siberia, Greenland, and Vancouver Island.

LAUREL FAMILY. Tropical shrubs or trees. See LAURACEÆ.

LAU′REL HILL. A range in southwestern Pennsylvania, separating the counties of Fayette and Westmoreland from Somerset (Map: Pennsylvania, B 3). In the South the range extends over the border into West Virginia. It is a ridge of the Alleghany Mountains, and its average height is over 2000 feet; it contains valuable deposits of bituminous coal.

LAUREL-WATER. A flavoring for medicines, obtained by distilling a mixture of chopped and bruised leaves of the cherry-laurel and water, after twenty-four hours' maceration. It is seldom prescribed medicinally in this country, but has been used as a sedative narcotic, in neuralgic pains, spasmodic cough, and palpitation of the heart; in short, in all the cases in which hydrocyanic acid (q.v.) is applicable. Death has occurred, with all the symptoms of hydrocyanic-acid poisoning, from its incautious use as a flavoring ingredient in creams and puddings.

LAUREMBERG, lou′rem-bĕrk, JOHANN (1590-1658). A German satirist. He was born and educated at Rostock, and, after travels in Holland, England, France, and Italy, and a course of medicine at Paris and at Rheims, became professor of poetry at Rostock in 1618. Five years afterwards he went to the Danish Academy of Soröe as professor of mathematics. He wrote, in Latin, a play, *Pompeius Magnus;* in Greek, an epithalamium, Κύπρις Πλέουσα; but found his proper place in the Low German dialect. His most famous work is his witty and realistic *Veer olde berönmede Schertzgedichte.*

LAU′RENCE, RICHARD (1760-1838). A Church of England scholar. He was born at Bath in 1760; graduated at Corpus Christi College, Oxford, in 1782. He entered the ministry of the Church of England and delivered the Bampton lectures in 1804, after which he became rector of Mersham, Kent. In 1814 he was appointed regius professor of Hebrew and canon of Christ Church, Oxford. In 1822 he became Archbishop of Cassel, and died in Dublin, December 28, 1838. It was largely through his influence that Oriental studies, long neglected in England, were restored to their rightful place. It was also through his instrumentality that several interesting apocryphal works, often quoted by the Fathers, but supposed to be lost, were recovered from the Ethiopic manuscripts. Among these were the *Ascension of the Prophet Isaiah* (1819), and the *Book of Enoch the Prophet* (1821). He published a new version of *First Esdras* (1820), also from the Ethiopic; also *Dissertations on the Logos of Saint John* (1808), *Critical Reflections Upon Some Important Misrepresentations Contained in the Unitarian Version of the New Testament* (1811), *On the Existence of the Soul After Death* (1834), and many occasional essays and sermons.

LAU′RENS, HENRY (1724-92). An American patriot of the Revolutionary period, descended from a family of Huguenots who fled to America after the Revocation of the Edict of Nantes. He was born in Charleston, S. C., engaged in mercantile pursuits in Charleston and London, and later established at Charleston a prosperous business. He retired, however, in 1771 and traveled for some time in Europe. In the pre-Revolutionary controversies between the American Colonies and the British Government, he early identified himself with the Whigs or Patriots, although he asserted the constitutionality of the Stamp Act, and discountenanced forcible opposition to the exercise of authority under such statutes. He was one of about forty Americans who petitioned Parliament against the passage of the Boston Port Bill, most of the petitioners being South Carolinians. He was president of the Council of Safety of South Carolina, was sent as delegate to the Continental Congress in 1776, and became its president November 1, 1777, which office he resigned December 1, 1778. In 1779 he was sent to Holland, charged with the negotiation of a commercial treaty, but fell into the hands of the British, and was imprisoned in the Tower for fifteen months. He was bailed out by Richard Oswald. Congress appointed him in 1781 one of the peace commissioners, and on November 30, 1782, he signed the preliminary treaty in Paris, in company with Adams, Jay, and Franklin. The collections of the South Carolina Historical Society contain many of his papers, which were collected after his death. His *Correspondence* was edited by Frank Moore (New York, 1861); and a narrative of his capture and confinement was published by the South Carolina Historical Society in 1857.

LAURENS, lō'räN', JEAN PAUL (1838—). A French historical painter, born at Fourquevaux (Haute-Garonne). He was a pupil of the Ecole des Beaux-Arts at Toulouse, and then in Paris of Cogniet and Bida. His compositions, depicting for the most part tragic and often gruesome episodes, are intensely dramatic in style and spirited in execution, and never fail to produce a deep impression, although their effect is frequently marred by an exaggerated realism and lack of harmonious coloring. Out of their considerable number may be mentioned: "Death of Tiberius" (1864); "A Voice in the Desert" (1868, Orleans Museum); "Execution of the Duc d'Enghien" (1872, Alençon Museum); "Popes Formosus and Stephen VII." (1872); "The Pool of Bethesda" (1873, Toulouse Museum); "Saint Bruno Refusing the Offerings of Roger, Count of Calabria" (1874, Church of Notre Dame des Champs, Paris); "The Interdict" (1875, Havre Museum); "Excommunication of King Robert the Pious, 1004" (1875, Luxembourg); "The Austrian General Staff Around the Deathbed of General Marceau" (1877, Ghent Museum), one of his finest works, which received the medal of honor in the Salon; "Release of the Immured at Carcassonne, 1303" (1879, Luxembourg); "Vengeance of Pope Urban VI." (1886); "Entry of Louis XVI. into the Hôtel de Ville, Paris" (1891); and "Napoleon and Pius VII. at Fontainebleau" (1894). For the Panthéon he painted in fresco "Two Scenes from the Life of Saint Geneviève," marked by solemn grandeur and replete with religious feeling. A portrait of himself (1882) is in the Uffizi Gallery, Florence. In 1891 he was elected a member of the Académie des Beaux-Arts, and president of the Société des Artistes Français.

LAU'RENS, JOHN (1753-82). An American soldier, the son of Henry Laurens (q.v.). He was born in South Carolina; was educated in England, and in 1777 entered the Continental Army as one of Washington's aides. In this position he discharged many of the duties of a private secretary, and his familiarity with foreign languages enabled him to be of great service in conducting the necessary correspondence with European officers in the service. He is said to have participated in all of Washington's battles, in several of which, while fighting with the utmost bravery, he was severely wounded. Early in 1781 he was sent on a special mission to France, and by appealing directly to the King, in spite of diplomatic precedents, succeeded in negotiating a loan. At Yorktown he served with reckless daring, and in the following year, while on the staff of General Greene, was killed (August 27th) in an insignificant skirmish on the Combahee River. His unusual abilities, coupled with his gallantry, his courtesy, and his chivalrous devotion to his country, made him a universal favorite, and won for him the title of the 'Bayard of the Revolution.' The army correspondence of Laurens, together with a brief memoir, by W. G. Simms, was privately printed in 1867 by the Bradford Club (New York).

LAURENS, JOSEPH AUGUSTIN JULES (1825-—). A French landscape painter and lithographer, born in Carpentras. He was a pupil of Delaroche. He traveled extensively in Persia, Turkey, and Asia Minor, and many of the drawings he made at this time were published in his *Voyage en Turquie et en Perse* (1856). His paintings in oil and water-color include: "Vue de la Grande Chartreuse" (1840); "Les environs de Vaucluse" (1845); "Forêt de Fontainebleau," "L'hiver en Perse" (1867); and "Le rocher de Vannes" (1879) in the Luxembourg. Among his lithographs are works after Diaz, Bonheur, Corot, Troyon, and others. He received the Legion of Honor in 1868, and a bronze medal at the Universal Exposition of 1889.

LAURENT, lō'räN', AUGUSTE (1807-53). A French chemist, born at La Folie, and educated under Dumas, whose assistant he became at the Ecole Centrale des Arts et Manufactures. He was for some time chemist at the pottery at Sèvres; taught chemistry at Bordeaux (1838-46); made especial research in naphthalin, paraffin, and phenol; but is better known for his contributions to theoretic chemistry, his definition of molecular and atomic weights, and his foundation (with Gerhardt) of the theory of types being especially important.

LAURENTIAN (lạ-rĕn'shan) **HEIGHTS,** or THE LAURENTIDES. The name given to the plateau-like height of land which forms the divide between the streams running into Hudson Bay and the two great water systems of the Saint Lawrence and the Mackenzie. (See under article AMERICA, *Physical Map North America*, LAURENTIAN PLATEAU.) It has the shape of a horseshoe or crescent of vast extent, reaching from Eastern Labrador to the Arctic Ocean west of Hudson Bay. Its average height is from 1000 to 3000 feet, and its surface is uneven, with a multitude of depressions occupied by lakes. The principal break through it is made by the Nelson River.

LAURENTIAN SYSTEM. A name given by Sir William Logan to a series of highly metamorphosed rocks, older than the Cambrian, which are strongly developed in Canada, especially in the region of the Laurentian Mountains. The system has received different values from various geologists, but the generally accepted classification limits it to the basal or fundamental complex of gneisses and granites of the

Archæan group which comprises also the Huronian system. See Pre-Cambrian Formations; Geology.

LAURENTIDES, lą'rĕn-tĭdz. A plateau in Canada. See Laurentian Heights.

LAURENTIE, lō'räN'tē', Pierre Sébastien (1793-1876). A French historian and journalist, born at Houga (Gers). He devoted his attention early in life to history, and in Paris was appointed professor of rhetoric at the Collège Stanislas in 1817, and assistant professor of literature at the Ecole Polytechnique in 1818. In 1822 he was appointed inspector-general of public education. In addition to articles for the journal *La Quotidienne,* of which the most famous is his essay "Sur la libertée fondée sur le droit divin," he published many works on history. The best known is his *Histoire de France* (1841-43).

LAURENTIUS, lą-rĕn'shĭ-ŭs. Antipope, 498. He was rival to Symmachus, elected on the same day in Rome. He represented the party desirous of keeping on friendly terms with Constantinople, and accepting the Henoticon of Zeno; while Symmachus represented the party opposed to such a course. Both sides had excellent leaders; the clergy apparently more generally favored Symmachus. Both appealed to the Arian King of Italy, the Ostrogoth Theodric at Ravenna, and he decided in favor of Symmachus. The followers of Laurentius kept up a hopeless and bloody struggle, but are not heard of after 501.

LAURENTIUS VAL'LA. See Valla.

LAUREN'TUM. A very ancient town of Latium, about sixteen miles southeast of Ostia, and near the modern Tor Paterno. In Roman legend it was the capital of King Latinus, Æneas's host, on his arriving in Italy, and was of some commercial importance during the traditional kingly period, but was later abandoned and left in ruins. With the growth of Rome, however, it was afterwards resettled, and became a fashionable resort of the wealthy Romans, owing largely to its extensive laurel groves. Pliny the Younger describes with minuteness his beautiful villa at Laurentum, and the Emperor Commodus (a.d. 180-192) passed much time there. Under Trajan (a.d. 98-117) the neighboring towns of Laurentum and Lavinium were recolonized and united under the name Lauro-Lavinium. See Lavinium.

LAURIA, lou-rē'ä. A city in the Province of Potenza, Italy, six miles south of the nearest railway station at Lagonegro, which is 114 miles by rail southeast of Naples (Map: Italy, K 7). It manufactures leather and woolen cloth, and the country produces grain, wine, fruit, and potatoes. Population (commune), in 1901, 10,099.

LAURIAN, lō'rē-äN', Augustu Trebon (1810-80). A Rumanian philologian and author. He was born near Hermannstadt, Transylvania, was educated at Klausenburg and Vienna, in 1844 was appointed a professor of philosophy in the College of Saint Sava at Bucharest, and in 1847 a councilor of education. In 1848 he took active part in the political disturbances in Transylvania, presented the Rumanian memorial to the Emperor Ferdinand, and was imprisoned by the Hungarians at Hermannstadt, but was soon liberated by the populace. He was appointed superior councilor of education in Moldavia in 1851, and general inspector of education and university professor at Bucharest in 1859. In 1867 he was elected to the Rumanian Academy. He founded and with Balcescu edited the *Magazin Istoric al Daciei* ("The Dacian Historical Magazine," 5 vols., 1845-48), in which appeared much of his best work. His *Istoria Romåniloru* (1853) and other volumes, on either Roman or Rumanian history, which he regarded as identical and continuous, are often defective through lack of special knowledge. His *Tentamen Criticum in Originem Linguæ Romanæ* (1840) was strongly opposed as written in a language not properly Rumanian. Like his *Dictionarul limbei romîne* (3 vols., 1871-76), an academic publication, and the *Glosar de vorbe străine* (1871), it extends the Latin historical method of Cipariu (emphasized by its adherents as the 'scientific' in contradistinction to the 'anarchistic,' or new, school), and on that basis introduces etymological spellings and large numbers of Latin words.

LAU'RIC ACID (from Lat. *laurus*, bay-tree, laurel), also called Laurostearic or Pichuric Acid, $C_{12}H_{24}O_2$. A fatty acid first described by Marsson in 1842. It occurs as a glyceride, laurostearin, in the fat of the bay-tree, and in the solid fat and volatile oil of pichurim-beans. It occurs in connection with myristic acid in the berries of Myrica gale, and in other plants. It also exists in connection with other fatty acids or their glycerides in spermaceti, and in cocoanut oil. It may be prepared from oil of bay by saponifying the oil with strong caustic potash, decomposing the soap with hydrochloric acid, and distilling the fatty acids thus set free in vacuo; the first portion passing over is almost pure lauric acid. Lauric acid is insoluble in water, but is readily soluble in alcohol and ether, and crystallizes from the alcoholic solution in white, silky needles or translucent scales, which melt at about 43.5° C. (110.3° F.). The laurates of the alkali metals and of barium are soluble in water. The other salts are insoluble, or slightly soluble.

LAURIE, lō'rē', André. The pseudonym of the French writer Paschal Grousset (q.v.).

LAURIE, lou'rê, Simon Somerville (1829—). A Scotch educator and philosopher. He was born in Edinburgh, and was educated at the high school and university of that city. He taught in Europe for five years, and on his return to Scotland held many educational posts. In 1855 he was secretary and visitor of schools on the educational committee of the Scotch Church; and in 1872, when the authority of this committee was abrogated by the Education Act, he became secretary to the Endowed Schools Commission. He was a member of the Edinburgh University Court, and president of the Teachers' Guild of England, and in 1876 became professor of the institutes and history of education in Edinburgh University. He wrote: *Philosophy of Ethics* (1866); *Primary Instruction in Relation to Education* (6th ed. 1898); *John Amos Comenius* (6th ed. 1898); *Ethica by Scotus Novanticus* (2d ed. 1885); *Mediæval Education and Rise and Constitution of Universities* (1886); and *Historical Survey of Pre-Christian Education* (2d vol. 1901).

LAURIER, lō'rĭ-â, Sir Wilfrid (1841—). A Canadian statesman. He was born at Saint Lin, Quebec, and was educated at L'Assomption College and McGill University. Admitted to the bar in 1864, he entered political life as a member of the Quebec Assembly from 1871 to 1874, and later became a member of the Dominion Parliament. He was Minister of Inland Revenue, 1877-78; was elected leader of the Liberal Party in 1891; and in 1896 became Premier of Canada, being the first French-Canadian to hold that office. His oratorical abilities earned him the name of 'Silver-tongued Laurier,' while his services to the Dominion and Empire have been recognized by the award of various honors, comprising a Queen's counselship in 1880, membership in the Imperial Privy Council, Knight Grand Cross of the Order of Saint Michael and Saint George. He received the cordon of a grand officer of the Legion of Honor during a visit to President Faure of France. His principal speeches, edited by Ulric Barthe, were published in 1890.

LAU'RION, or **LAU'RIUM** (Lat., from Gk. *Λαύριον*, *Λαύρειον*, *Laureion*). A promontory in Southeast Attica, Greece, projecting into the Ægean Sea, celebrated for its mines. They seem to have been known in prehistoric times, and there are numerous Mycenæan remains throughout this region. It is also possible that they were later worked by the Phœnician traders. But they first became important toward the end of the sixth century B.C., with the growth of Athenian power and commerce. During the fifth and fourth centuries they were of the greatest value to the commercial supremacy of Athens, but with the increased supplies of the precious metals which resulted from the Eastern conquests of Alexander the Great their importance rapidly declined, and about the beginning of the Christian Era they were abandoned. The mines were the property of the Athenian State, which leased them to citizens who worked them by slave labor. The chief product was silver, though lead was also obtained in large quantities, and the yield of minium (red oxide of lead) and ochre was of appreciable value. The mines were worked by cutting narrow galleries in the rock and the products were separated by crushing or grinding, washing and melting. In 1860 a Marseilles company bought the right to work over the heaps of refuse, from which much lead was extracted. In 1869 a dispute arose over the limitations imposed by the contract; and after a protracted lawsuit, the company in 1873 purchased a large tract of land. Since then two large and three smaller companies have occupied the territory, and carry on profitable operations in the production of lead, cadmium, and manganese. Silver, the most important product in ancient times, is of little value at present. The mines are connected by rail with Athens through the port of Laurion or Ergasteria, which has a good harbor, workshops, smelting-furnaces, and a population (1896) of 7926. Consult the very complete account of the mines of Laurion by Ardaillon, *Les mines du Laurion dans l'antiquité* (Paris, 1897), where is given a bibliography of the earlier literature.

LAURISTON, lō'rē'stôN', JACQUES ALEXANDRE BERNARD LAW, Marquis de (1768-1828). A French marshal, born at Pondicherry, India. He was educated at the Ecole Militaire in Paris, and at Brienne, where he was a comrade of Napoleon. He entered the army in 1785, and from 1792 was with the Republican armies in the Netherlands and on the Rhine. In 1800 he became aide-de-camp to Napoleon, who sent him to England in 1802 to transmit the articles of the Peace of Amiens. He was made brigadier-general in 1805, and Governor-General of Venice in 1807. At Wagram (1809) his artillery at a critical moment crushed the Austrian centre and gained the victory. He was Ambassador to Saint Petersburg in 1811, took part in the Russian campaign of 1812, fought at Lützen and Bautzen, and was taken prisoner at Leipzig (1813). After the Restoration Louis XVIII. made him a general of division (1815), and gave him the title of marquis (1817). He became a marshal of France, and took part in the invasion of Spain in 1823.

LAU'RIUM. A mining district of Greece. See LAURION.

LAURIUM, lạ'rĭ-ŭm (formerly CALUMET). A village in Calumet Township, Houghton County, Mich., 11 miles north by east of Houghton, the county-seat; on the Mineral Range and the Copper Range railroads (Map: Michigan, E 1). It is situated on Keweenaw Peninsula, in one of the richest copper districts of the United States, and in the vicinity of several of its most famous mines. Population, in 1890, 1159; in 1900, 5643.

LAU'RUSTI'NUS (Neo-Lat., from Lat. *laurus*, laurel + *tinus*, sort of plant), or LAURESTINUS (*Viburnum Tinus*). An ornamental shrub, native of the south of Europe and the north of Africa, which belongs to the Caprifoliaceæ, or honeysuckle family. It is an evergreen, with dark, shining, leathery leaves and with corymbs of small whitish flowers, which appear in winter or early spring, and are followed by small blackish-blue, acrid berries, which inflame the mouth and have drastic, purgative properties. Some kinds of birds, however, eat them with avidity. Since the laurustinus cannot endure much frost, it is grown in northern latitudes as a greenhouse or house plant for winter flowering. Sometimes it is planted out in summer. See VIBURNUM.

LAURVIG, lour'vēg, or **LARVIK.** A seaport of Norway, situated on the Larvikfjord, at the mouth of the river Laagen (Map: Norway, C 7). The town has a pleasant situation. There are sulphur and iron springs in the neighborhood. The chief trade is in wooden ware. Population, in 1901, 10,664.

LAUSANNE, lō'zȧn' (Lat. *Lausonium*). Capital of the Swiss Canton of Vaud, situated about one mile north of Lake Geneva, and nearly 500 feet above the level of the lake (Map: Switzerland, A 2). It lies largely on the lower slopes of Mont Jorat, and consists of several quarters on both sides of the Flon, which has been partly filled up. A two-story viaduct known as the Grand Pont connects the quarters of Saint-François and Saint-Laurent. The Place de la Riponne is the finest square. The imposing cathedral, built in 1235-75 and recently restored, is Gothic and of fine proportions. It is noted as the scene of a disputation in 1536 which was participated in by Calvin, Farel, and Viret, and which resulted in the secession of the canton from the Catholic Church. On a hill west of the town stands the National Supreme Court of Appeals, a handsome Renaissance building designed by Recordon. The old town hall, and the prison, modeled after the Pennsylvania system, the theatre, the new post-office, the cantonal bank, and the university are also notable buildings.

The educational institutions of Lausanne are numerous and excellent. The university, founded in 1536 as an academy for Protestant ministers, and constituted a university in 1891, has five faculties and an attendance of about 600 students. There are schools for instruction in agriculture and viticulture, and numerous boarding-schools patronized by foreigners. The cantonal library has nearly 125,000 volumes. The cantonal museum contains natural history collections, relics from ancient Lausanne, remains from lake dwellings, coins, medals, etc. The charitable institutions include a noted blind asylum and a splendid insane asylum. The manufactures consist chiefly of machinery, tobacco, and chocolate. There is some trade in grain and lumber, and in the wines of the vicinity. The port of Lausanne is the adjoining town of Ouchy.

Lausanne is a favorite place of sojourn for English and Germans, and has been the residence of many distinguished persons. Population, in 1818, 34,049; in 1900, 47,444. The inhabitants are mostly Protestants, and speak French. Lausanne was probably founded at the beginning of the sixth century. It became the seat of a bishopric in 590. It remained under the rule of its bishops (who attained princely rank in 1125) until the introduction of the Reformation in 1536, when it came under the control of Bern. In 1803 it was made the capital of the newly created Canton of Vaud.

LAUSER, lou'zĕr, Wilhelm (1836-1902). A German historian and essayist, born at Stuttgart. He studied at Tübingen and Heidelberg, and spent five years in Paris as a journalist. He edited various papers, and in 1896 became editor of the Berlin *Norddeutsche Allgemeine Zeitung*. His published works include: *Aus Spaniens Gegenwart* (1872); *Geschichte Spaniens von dem Sturz Isabellas bis zur Thronbesteigung Alfonsos XII.* (1878); *Unter der Pariser Kommune* (1878); *Kunst in Oesterreich-Ungarn* (1884); and *Der erste Schelmenroman* (1889).

LAUSSEDAT, lōs'dȧ', Aimé (1819—). A French geodesist and astronomer. He was born at Moulins, and studied at the Polytechnique (1840), in which, after active service in the engineers, he became professor of geodesy and astronomy (1851). Fourteen years afterwards he was appointed professor of applied geometry at the Conservatoire des Arts et Métiers, and in 1881 was appointed director of that institution. The adoption of Paris time for all France by the law of 1891 was largely due to Laussedat's endeavors; and he was elected president of the commission on aërial transportation. He is known for his improvements in geodetic photography and astronomical instruments.

LAUSITZ, lou'zĭts. A district in Germany. See Lusatia.

LAUTERBRUNNEN, lou'tĕr-brun-nen. A village and tourist resort in the Canton of Bern, Switzerland, 6½ miles southeast of Interlaken. Population, in 1900, 2547. It is built on both sides of the White Lütschine, in a deep rocky valley, noted for its picturesque scenery; mountain views, including the Jungfrau and the Breithorn; its numerous streams (whence its name, signifying 'nothing but springs') and cascades; of which the Staubbach and Trummelbach are the most celebrated.

LAUTREC, lō'trĕk', Odet de Foix, Seigneur de (1485-1528). A French marshal. He was the son of Jean de Foix, and the brother of Françoise de Châteaubriant, the celebrated mistress of Francis I. All his life a soldier, he fought under his cousin, Gaston de Foix, at Ravenna (1512); was present at Marignano; took the Constable de Bourbon's place as Governor of Milan; was defeated by Prospero Colonna at La Bicocca (1515-22), and five years afterwards, as commander of the army in Northern Italy, reëstablished the French dominion there. He died of the plague during the siege of Naples. Brantôme calls him one of the great French captains.

LAUZON, lō'zôN', Armand Louis de Gontaut-Biron, Duke de (1747-93). A French soldier, born in Paris. After a youth of furious dissipation, he led in 1779 a successful expedition against the English in Senegal and Gambia, and in 1780 came to America, where he fought at Yorktown. In 1788 he succeeded to the title of Duke de Biron, and was a Deputy to the States-General, and the supposed agent of the Duke of Orleans. He was Commander-in-Chief of the Army of the Rhine in 1792, and of the Army of La Rochelle in 1793. After taking Saumur and defeating the Vendeans at Parthenay, he resigned owing to machinations carried on against him by his subordinates. Accused before the Committee of Public Safety of having been too lenient in his treatment of the Vendeans, he was imprisoned, tried before the Revolutionary Tribunal for conspiracy, condemned December 31, 1793, and executed the same day.

LAUZON, Jean de (1582-1666). French Governor of Canada. He early became interested in New France, and was made president of the Hundred Associates, a company organized to further the settlement of the French dominions in America. He directed most of his energies to securing immense grants of territory for himself and for members of his immediate family, and in this way he procured for his son a tract of land extending for sixty leagues along the Saint Lawrence with the exclusive right of fishing in that river, while for himself he secured the island of Montreal, which he afterwards sold to the Jesuits. In 1651 he became Governor of New France. His administration of five years was weak and vacillating in policy. In 1656, shortly before the end of his second term, he returned to France, leaving the government in the hands of his son, de Charney, who soon followed his father's example, leaving a second substitute to direct the fortunes of New France.

LAUZUN, lō'zụN', Antoine Nompar de Caumont, Duke de (1633-1723). A French soldier, born in Gascony. He came to Court about 1669, and won the favor of the young Louis XIV. by his energy, shrewdness, and a certain swashbuckling carriage that differed favorably from the common courtier's demeanor. The King made him captain of the musketeers, Governor of Berry, and maréchal-de-camp, and promised him the mastership of the ordnance. The favorite's overbearing conduct brought him a term in the Bastille, but he was soon released and mollified with the command of the army in Flanders (1671). Louis intended to marry Lauzun to Mlle. de Montpensier, La Grande Mademoiselle, granddaughter of Henry IV., but Court intrigues seem to have prevented the marriage, though there is some authority for believing that a secret marriage did take place some two years later. The enmity of Mme. de Montespan sent Lauzun to the prison again at Pignerol in 1671, and there he stayed till 1676, when he was released and banished. In 1680 he obtained permission to return to Paris. He went to England in 1688, returning in the same year after the Revolution, as escort to James II.'s Queen and infant son. Louis restored him to partial favor. In 1689 he led a French force to Ireland, and fought for James II. in the disastrous battle of the Boyne in 1690. In 1692 he became duke, and three years later married Mlle. de Durford, a girl of sixteen.

LAVA (It., stream). Molten rock material which is poured out at the surface of the earth either from volcanoes or in fissure eruptions. Fissure eruptions, while not numerous, have been exceptionally extensive, as in the Deccan of India, and the Snake River plains of the Northwestern United States. Siliceous lavas usually have a pasty or ropy consistency, and flow sluggishly, while basaltic lavas are usually fluid and flow freely. The former build up volcanic cones of steep slopes, as in Central France, whereas basaltic lavas form volcanic cones of gentle slopes like those of Etna or the Hawaiian volcanoes. Some lavas decompose and disintegrate with amazing rapidity and form a fertile soil for the vine. Others, but slightly different in composition, present for centuries a firm unyielding surface to the elements. Lavas may be either compact or vesicular, slaggy, scoriaceous, or pumiceous. See IGNEOUS ROCKS; BASALT; DIKE; VOLCANO.

LAVAL, lȧ′vȧl′. The capital of the Department of Mayenne, France, situated on the river of the same name, 46 miles by rail from Rennes (Map: France, F 3). It is an ancient town of some picturesqueness. The cathedral, begun in the twelfth century and finished in the sixteenth, is of little architectural merit. The old château of the dukes of Laval is now used as a prison, and the adjoining modern château in Renaissance style is used as the Palais de Justice. Besides the above-mentioned buildings Laval has an old linen hall now used for exhibitions, an art museum, and an episcopal palace. The educational institutions include a lycée, a normal school, a seminary, and a library. Laval is noted for its linen industry which was introduced there in the fourteenth century. It also manufactures cotton goods, paper, leather, machinery, trimmed lumber, and marble products. Laval is the seat of a bishop. Population, in 1891, 30,374; in 1901, 30,356. The town dates from the ninth century. Near here the Vendeans achieved a victory in October, 1793.

LA VALETTE, lȧ vȧ′lĕt′, ANTOINE MARIE CHAMANS, Count de (1769-1830). A French soldier, aide-de-camp to Bonaparte. He was librarian at Saint-Geneviève at the outbreak of the Revolution (1789). He sympathized with the more moderate party in attempting to save the lives of the King and Queen; entered the army, and served with Bonaparte in Italy and Egypt. Afterwards he held the positions of Ambassador to Saxony, post director and Councilor of State under Napoleon I., and again in the Hundred Days, but was condemned to death by Louis XVIII. His wife connived his escape in her clothes on the eve of his intended execution. After five years' banishment in Bavaria he was permitted to return.

LA VALETTE, JEAN PARISOT DE. See VALETTE.

LAVALLEY, lȧ′vȧ′lȧ′, ALEXANDRE THÉODORE (1821-92). A French engineer. He studied at the Ecole Polytechnique, became an officer in the engineers, but resigned from the service, and carried out with Borel part of the work on the Suez Canal. He directed the engineering work of the port, and in 1876 undertook the construction of the railroad at Pointe des Galets, Réunion. He published *Communications à la société des ingénieurs civils sur les travaux de l'isthme de Suez* (Paris, 1866-69).

LA VALLIÈRE, lȧ vȧ′lyâr′, LOUISE FRANÇOISE DE LA BEAUME LE BLANC DE (1644-1710). A mistress of Louis XIV. of France, born in Touraine, of an ancient and noble family. At an early age she lost her father, and was brought to Court by her mother, who had married a second time. She was not a great beauty, and had a slight lameness; but her amiability and winning manners rendered her attractive. She bore the King four children, of whom two died in infancy. In 1674 she entered the Convent of the Carmelites in Paris, and spent thirty-six years there, in penance and prayer. She is considered the author of a book entitled *Réflexions sur la miséricorde de Dieu* (Paris, 1680), of which a copy, dated 1688, with corrections by Bossuet, was discovered in the Louvre in 1852. A collection of her letters was published in 1767.

LAVAL-MONTMORENCY, lȧ′vȧl′-môN′mô′-räN′sé′, FRANÇOIS XAVIER DE (1622-1708). A French bishop. He was born at Laval, France, received the tonsure at the age of nine, was made a priest at twenty-three, and six years later was named missionary Bishop of Cochin-China. He declined the office, however, and in 1653 was appointed Archdeacon of Evreux. In 1659 he was sent to Canada as Vicar of the Pope, with the title of Bishop of Petra *in partibus*. He established the Seminary of Quebec (1663) under letters patent of Louis XIV., and used his immense influence to direct in large measure the policy of the Government. He actively opposed the sale of intoxicating liquors to Indians. In 1674 he became titular Bishop of Quebec, an office which he held till 1683, when he resigned and devoted himself to the conduct of the affairs of the seminary. His name is perpetuated in the Laval University at Quebec, and is regarded with great veneration by the French Canadians, though Parkman takes a severer view of him.

LAVAL UNIVERSITY (*Université Laval*). A French Catholic institution in Quebec, Can., founded in 1852, established and maintained by the Quebec Seminary. By a Papal bull of 1876 the university secured extended privileges, and the Cardinal Prefect of the Propaganda was made its protector at Rome. Its doctrine and discipline are in the control of a Superior Council, composed of the archbishops and bishops of the Province of Quebec, under the presidency of the Archbishop of Quebec, who is the apostolic chancellor of the university. By virtue of its royal charter the visitor of the university is always the Catholic Archbishop of Quebec, with the power of veto over all the rules and nominations. The university council consists of the directors of the Quebec Seminary and the three senior-professors of each faculty. There are four faculties—theology, law, medicine, and arts—in each of which the bachelor's, master's, or licentiate's, and doctor's degrees are conferred. The theological professors are appointed by the visitor, all others by the council. In 1902 the university had 384 students, of whom 103 were in theology, 84 in law, 97 in medicine, and 100 in arts. The faculty numbered 51, and the library contained 140,000 volumes. The extension work of the university is carried on through a branch at Montreal, which is practically independent, and by a system of affiliated seminaries throughout the Province of Quebec. Rector, Monseigneur, O. E. Mathieu.

LAVATER, lä′vȧ-tẽr, JOHANN KASPAR (1741-1801). A Swiss mystic, founder of what is known as the 'art of physiognomy.' He was born in Zurich, the son of a physician. As a boy he showed no remarkable aptitudes, though in youth he gave proof of power by coming forward in 1762 with the artist Henri Fuseli to accuse the *Landvogt* Grebel of oppression and injustice, under which others had groaned without daring to complain. A volume of poems entitled *Schweizerlieder* (1767) early gained for Lavater a great reputation. *Aussichten in die Ewigkeit* (3 vols., 1768-73), his next publication, speedily ran through several editions. The tone of his work is one of exalted religious enthusiasm, mingled with asceticism; for Lavater was a mystic both in theology and philosophy. This gave to his opponents an opportunity to accuse him of all manner of heresy. Possessing the keenest powers of observation and the most delicate discrimination of human traits, Lavater came to believe that the character of men could be discovered in their countenances. He labored to form a system of physiognomy, hoping thus to promote the welfare of mankind; and at last published the work upon which his fame chiefly rests, *Physiognomische Fragmente zur Beförderung der Menschenkenntniss und Menschenliebe* (4 vols., 1775-78). Lavater at first hailed the French Revolution with joy; but after the murder of the King he regarded the whole movement with religious abhorrence. At the capture of Zurich by Masséna, while aiding the wounded in the street, Lavater himself received a wound, from the effects of which he died.

LAVATER, LOUIS. The pseudonym of the Alsatian historian Ludwig Adolf Spach (q.v.).

LAVEDAN, lȧ′ve-dăN′, HENRI (1859—). A French novelist, dramatist, journalist, and critic. His contributions to *La Vie Parisienne*, *Gil Blas*, and other journals are signed Manchecour. Of his plays the best, *Une famille* (1890), won a prize from the Academy. His fiction, mainly short stories, of which the volume *La Haute* (1891) is typical, sparkles with dry and often cynical wit, and delicate yet biting irony.

LAVELEYE, lȧ′v′-lā′, EMILE DE (1822-92). A Belgian political economist and publicist, born at Bruges. He studied at Ghent, and in 1864 was made professor of political economy in the University of Liège. He was a member of the international jury at Paris, 1867, and a corresponding member of the Academy of Moral and Political Sciences of Paris. Laveleye wrote much for the *Revue des Deux Mondes* and other periodicals. His most important works are: *De la propriété et ses formes primitives* (1874); *Le socialisme contemporain* (1881); *Eléments d'économie politique* (1882); *Le gouvernement dans la démocratie* (1891); *La monnaie et le bimétallisme internationale* (1891).

LAVENDER (ML. *lavandula*, *lavendula*, lavender, from It. *lavanda*, lavender, washing, from It., Lat. *lavare*, to wash; connected with Lat. *luere*, Gk. λούειν, *louein*, to wash), *Lavandula*. A genus of plants of the natural order Labiatæ, having the stamens and style included within the tube of the corolla, the corolla two-lipped, the upper lip bifid, the lower trifid. The common lavender or narrow-leaved lavender (*Lavandula vera*) grows wild on stony mountains and hills in the south of Europe, and in more northern regions is very generally cultivated in gardens. It has an aromatic fragrance, aromatic bitter taste, and contains a volatile oil, oil of lavender. The whole plant is credited with stimulant properties, but particularly the flower-spike, and is used in medicine as a tonic, stomachic, nerve stimulant, etc. Lavender-flowers are often put into wardrobes to keep away moths. They are much used in perfumery. Lavender is extensively cultivated for its flowers in France, and in some places near London. Broad-leaved lavender (*Lavandula spica*) is also a native of the south of Europe, but is more tender than common lavender. It is also less fragrant, and the oil which it yields is called oil of spike, and sometimes foreign oil of lavender. Lavender is grown occasionally in gardens in the United States, especially in California, but nowhere as yet on a commercial scale.

LAVENDER.

LAVERAN, lȧ′v′-răN′, CHARLES LOUIS (1812-79). A French military physician, born at Dunkirk. He studied at Lille; was assistant at the hospital of Algiers, and professor at the military hospital at Metz (1841-50), whence he returned to Algeria. At the Ecole Val de Grâce he became professor of epidemiology, physician in charge, and director. After acting as sanitary inspector of the Army of the North in the Franco-Prussian War, he was for a time head of the military school at Montpellier; but in 1872 went back to Val de Grâce. His great work, *Traité des maladies et des épidémies des armées*, published in 1875 by his son, is largely supplemented by his contributions to medical journals, and to the *Dictionnaire encyclopédique des sciences médicales.*

LAVERAN, Charles Louis Alphonse (1845—). A French physician, the discoverer of the plasmodium of malaria. He was born in Paris, the son of Charles Louis Laveran. He entered the School of Military Medicine at Strassburg in 1863, taking his degree in 1867. Six years later he was appointed professor at Val de Grâce. In 1878 he left for Algeria to investigate malarial fevers, and remained there until 1883, when he returned to Val de Grâce to occupy the chair of military hygiene and clinical medicine until 1894. He then held the post of director of the Eleventh Corps in the Army Medical Service, retiring in 1897. Subsequently he became physician-in-chief at the Lille Hospital, and a member of the French Academy of Medicine. He wrote several treatises on malaria, summarized in *Traité des fièvres palustres* (1884), which announced the discovery of the hæmatozoön of malaria, and obtained the Bréant prize. He also published: *Traité des maladies et épidémies des armées* (1875), written by his father; *Eléments de pathologie médicale,* in collaboration with Teissier (1894); the article "Maladies épidémiques" of the *Traité de pathologie générale* of Professor Bouchard; and *Traité de hygiène militaire* (1896). See Malaria.

LAVERDIÈRE, lȧ'vȧr'dyȧr', Claude Honoré (1826-73). A Canadian educator and author. He was born in the Province of Quebec, and was educated for the priesthood, to which he was ordained in 1851. He afterwards became a professor in the Quebec Seminary, and assistant librarian of Laval University. He did much to bring to light and to popularize the achievements of the early heroes of French Canada. Three volumes of the *Jesuit Relations* (1858) were in part published by him, and he edited the *Voyages of Champlain,* with notes and a life of that explorer (1870); also the *Journal des Jésuites* (1871). He also produced a popular *History of Canada,* and edited a collection of French-Canadian songs and hymns.

LAVER'NA. In Roman mythology, the protecting goddess of thieves and impostors. The Porta Lavernalia, near which an altar was erected in her honor, was named for her.

LAVIGERIE, lȧ'vē'zhrē', Charles Martial Allemand (1825-92). A French prelate and missionary. He was born at Bayonne; educated in the schools of the Petite Séminaire and the Séminaire de Saint Sulpice, Paris; appointed professor of ecclesiastical history at the Sorbonne in 1853; domestic prelate to the Pope, French auditor in Rome, Bishop of Nancy, in 1863; and Archbishop of Algiers in 1867. He had previously become an officer of the Legion of Honor, and in 1874 established his famous Central-African mission. In 1881 he was appointed administrator of ecclesiastical affairs in Tunis, and made a cardinal in 1882. Lavigerie devoted the best energies of his life to the suppression of slave-hunting and slave-barter; he lectured to great audiences in the various European capitals; and finally secured the agreement between the English and German governments to enforce rigidly the anti-slavery clause of the Congo Conference, and to call an international congress at Brussels, to determine on a plan of international action. In 1890 he created a sensation in France by a speech advocating the acceptance of the Republic by the Church, it was said, under the tacit authorization of Pope Leo XIII. He died in Algiers, November 26, 1892. His *Œuvres choisies,* principally relating to missionary and anti-slavery efforts, were published in two volumes (Paris, 1884).

LAVIGNAC, lȧ'vē'nyȧk', Albert (1846—). A French writer on music, born in Paris. He received his musical education in that city, and in 1882 became professor of solfeggio at the Conservatory. He was subsequently made professor of harmony, and awakened wide interest by championing the cause of musical dictation, for the furtherance of which he wrote *Cours complet théorique et pratique de dictée musicale* (1882). His best-known work is *La musique et les musiciens* (1895; trans. into Eng. 1899), which is one of the best books on the subject, and gives a lucid and interesting treatment of musical technicalities and theories. His other works include: *Cinquante leçons d'harmonie; le voyage artistique à Bayreuth* (1897); *Les drames musicales de Richard Wagner* (1897, Eng. trans. 1898); *Les gaîtés du Conservatoire* (1898).

LA VILLEMARQUÉ, lȧ vēl'mär'kā', Théodore Claude Henri Hersart, Vicomte de (1815-95). A French antiquary and Celtic scholar, born at Quimperlé, Brittany. His first important work was a collection of popular Breton songs and melodies, in two volumes, published in 1839, with a French translation and notes, under the title of *Barzas-Breiz.* Three years afterwards appeared his Popular Tales of Brittany, in two volumes, to which was prefixed a dissertation on the story of the Round Table. His next work was a collection of the poems of the Celtic bards of the sixth century with a French translation, and explanatory and critical notes (1850). This publication made the labors of La Villemarqué widely known. In 1851 he was elected corresponding member of the Academy of Berlin, and in 1858 a member of the French Institute. He has since published a work entitled the Celtic Legends (*La légende celtique*) of Ireland, Cambria, and Brittany, which contains such of the original texts—Irish, Welsh, or Breton—as are rare or unpublished. La Villemarqué is the author or editor of several other works connected with the Celtic literature and languages, among which are a *Breton Grammar* (1849); a *Breton and French Dictionary* (1857); *Brittany, Ancient and Modern;* and *The Great Mystery of Jesus* (1865).

LAVIN'IA. In Roman tradition, the daughter of Latinus (q.v.), King of the aborigines and wife of Æneas, who named in her honor the newly built town of Lavinium.

LAVIN'IUM. A very ancient town of Latium, about 16 miles southeast of Rome, where the modern village of Pratica stands. Legend states that it was founded by Æneas and named in honor of his wife, Lavinia, daughter of King Latinus. With the growth of population, the town became overstocked, and Ascanius, or Iulus, son of Æneas, led away part of the inhabitants and founded Alba Longa, the traditional mother-city of Rome. Lavinium was renowned in very early times for its sanctuary of Venus, and for its cult of the tutelary gods of the Latin League, of which it became a sort of religious centre. Like other important Latin towns of the earlier period, it gradually lost its prestige with the growth of Rome. The Emperor Trajan (A.D. 98-117) gave it a new lease of life by joining the colonies of Laurentum and Lavinium, under the name Lauro-Lavinium, and locating there new colonists. It should be noted that the modern Civita Lavinia is on the site of the ancient *Lanuvium*, not Lavinium.

LAVISSE, lȧ'vēs', ERNEST (1842—). A French historian, born at Nouvion-en-Thiérache, Aisne. He was educated at a classical school in Paris, and at the Superior Normal School, and received a fellowship in history in 1865. He taught for ten years in the lyceums at Nancy, Versailles, and at the College of Henry IV.; was then appointed master of conferences at the Superior Normal School, and in 1888 became professor of modern history in the Faculty of Letters at Paris. In 1892 he was elected to the French Academy. He is distinguished alike for the clearness and carefulness of his elementary works, and for the authoritative character of his researches. His lectures, the most popular at the University of Paris, and his extensive contributions to historical literature, have won for him a high place among French historians. In both he has striven to bring about a better feeling between France and Germany, and his personal popularity has been evidenced by his election as president of the Association of French Students. Among his published works are: *La marche de Brandebourg sous la dynastie ascanienne, étude sur l'une des origines de la monarchie prussienne* (1875); *Leçons préparatoires d'histoire de France* (1876); *Etudes sur l'histoire de Prusse* (1879), crowned by the Academy; *La première année d'histoire de France* (1883); *Sully* (1880); *Trois empereurs d'Allemagne* (1888); *Histoire de France et notions d'histoire générale* (1890, with M. Duruy); *Vue générale de l'histoire politique de l'Europe* (1890); *La jeunesse du grand Frédéric* (1891). With Rambaud he edited and contributed largely to the great *Histoire générale du IVème siècle à nos jours* (1893 et seq.).

LAVOISIER, lȧ'vwä'syā', ANTOINE LAURENT (1743-94). The founder of modern chemistry. He was born in Paris, and was educated at the Collège Mazarin. He showed great aptitude for the mathematical and physical sciences, studying mathematics under Abbé Lacaille, botany under Jussieu, and chemistry under Rouelle. He then traveled through France with Guettard, who was at the time engaged in important geological work. As early as 1768 Lavoisier became a member of the Academy of Sciences, and in the following year he obtained a post as farmer-general of the revenue, by which he was enabled to devote most of his time to research work. Between 1772 and the year of his death, Lavoisier worked out the principles forming the cornerstone of modern chemistry, and during this time held several important positions. In 1776 he was made director of powder-works and introduced valuable improvements in the manufacture of gunpowder. In 1778 he was appointed one of the trustees of the Bank of Discount. In 1790, as a member of the Commission of Weights and Measures, he was engaged in preparing the decimal system. In 1791 he was commissary of the treasury, and published an interesting paper on the economic condition of France. The farmers-general of the revenue were men of eminent social position and considerable wealth, and in the Reign of Terror their wealth became a source of great danger to them. In 1794 Dupin, one of the members of the Convention, accused them of being enemies of their country; Fouquier-Tinville presented the accusation before the Revolutionary Tribunal, and the twenty-seven farmers-general were condemned to die. In vain had one of Lavoisier's friends endeavored to produce an impression on the Tribunal by describing his scientific achievements. The answer was, "We need no more scientists in France."

At the very foundation of all chemical thought is the law of the conservation of mass. Lavoisier, although not the first to divine that matter is everlasting, was the first to understand that that important truth must be established inductively by the use of the balance. By a series of quantitative experiments Lavoisier proved that, whatever the change in kind, the total amount remains the same; and as all relations of quantity are mathematical relations, Lavoisier saw that every chemical change could be expressed by an equation showing that the sum of the masses of the reacting substances is equal to the sum of the masses of the resulting products. When iron, mercury, tin, and other metals were exposed to the action of the air, their weight increased. The resulting earths contained, besides the matter of the metals, other matter, and could naturally be split up again into their constituents; they were therefore complex, not simple substances. The quantitative method of Lavoisier thus threw light on the nature of various substances and led to a clear definition of the idea of chemical elements. Lavoisier also advanced a general theory of the formation of chemical compounds. According to this theory, all compounds have a *binary* constitution. A binary compound of the first order is one made up of two elements. A binary compound of the second order is formed by the union of two binary compounds of the first order. The acids formed by the union of sulphur, nitrogen, phosphorus, and similar substances with oxygen are binary compounds of the first order. Acids are neutralized by bases with formation of salts; therefore salts are binary compounds of the second order. In subsequent times the binary theory proved inadequate and had to be abandoned. It had not lived, however, without giving birth to a series of important results. Since bases were classed by it as compounds of oxygen with metals, chemists were led to search for methods of isolating the latter by decomposing the bases. Thus came the discovery of the alkali and the alkaline earth metals by Davy and the isolation of aluminum by Wöhler, the importance of which for both science and the industries is inestimable. Another important work, in the perfection of which Lavoisier took an active part, must be mentioned here. Little progress could be made in chemical thought without the aid of a system of names which might constantly remind of the composition and properties of compounds. In conjunction with Berthollet, Fourcroy, and Guyton de Morveau, at the instance of the last-named, Lavoisier devised a system of rational nomenclature, which is in its main features still used in the chemistry of to-day.

All of his ideas were based on observations which had already been made by others. It is a sad but well-established fact that he often published such observations as his own. But the shadow of his petty scientific plagiarism dwindles into nothing in the light of the brilliant achievements which were indisputably his.

Lavoisier's works include: *Sur la combustion en général* (1777); *Réflexions sur le phlogistique* (1777); *Considérations sur la nature des acides* (1778); *Mémoire sur l'affinité du principe oxygène avec les différentes substances auxquelles il est susceptible de s'unir* (1782); *Méthode de nomenclature chimique* (jointly with Guyton de Morveau, Berthollet, and Fourcroy, 1787); *Mémoire sur la respiration des animaux* (jointly with Séguin, 1789); *Traité élémentaire de chimie* (2 vols., 1789), giving a list of 33 elementary substances, including caloric and light; *Opuscules physiques et chimiques* (1774 and 1801). In 1789 he founded the *Annales de chimie.* Two volumes of his *Mémoires de chimie* were published posthumously in 1805. His complete works have been published by the French Government under the title: *Œuvres de Lavoisier publiées par les soins de Son Excellence, le Ministre de l'Instruction Publique* (6 vols., 1864-93).

Numerous accounts of Lavoisier's life and work have been written. An admirable sketch of his achievements forms part of Wurtz's introduction to his *Dictionnaire de chimie pure et appliquée.* Consult, also: Grimaux, *Lavoisier d'après sa correspondance, ses manuscrits, ses papiers de famille et d'autres documents inédits* (Paris, 1888); and Schultze, *Lavoisier, der Begründer der Chemie* (Hamburg, 1894).

LA VOISIN, lȧ vwä′zăN′ (?-1680). A French sorceress. She was a midwife, but, not finding this profitable enough for her debaucheries, began to tell fortunes and the like, and people in high society became her customers. When the Marquise de Brinvilliers (q.v.) made her confessions; the people of Paris were panic-stricken at the revelations, and La Voisin was suspected of having sold poison to bring about the death of various persons. She was arrested in 1679 and imprisoned in the Bastille, together with forty of her supposed accomplices. In the following year she was brought before a chambre ardante (q.v.) which condemned her to death, and on February 22, 1680, she was burned at the stake.

LAW (AS. *lagu*, from *liogan*, Goth., OHG. *ligan*, Ger. *liegen*, to lie; connected with OChurch Slav. *lezhati*, to lie, Lat. *lectus*, couch, Gk. *λόχος*, *lochos*, lair). CONCEPTION. The social life of men, like the life of the individual, is largely shaped and governed by what we call nature. In this word we sum up the conditions which man has not created, and which he can but slightly modify, and the forces which he does not exert and which he has been able to utilize only to a limited extent. In so far as constant relations (coexistence, sequence, cause, and effect) are observed in the phenomena of nature, we speak of the laws of nature. The social life of men is further shaped and governed by conditions which man has established and which he can largely modify, such as the economic, the social, and the political organization, and by the human as well as the natural forces which man puts at work in the struggle for existence, enjoyment, wealth, and power. Here again constant relations of phenomena are observed which we call economic or social laws; and here again the term law describes a relation of coexistence or of sequence of cause and effect, which man has apparently no power to modify. He can modify the antecedent facts, but the facts once given, the results appear to be inevitable. Again the social life is shaped and governed by relations of cause and effect which man has himself established. Society itself attaches to certain acts and omissions of men such results as social ridicule or contempt or scorn and ostracism; and in such cases we sometimes say that society is enforcing, by psychical sanctions, laws of etiquette or of honor, or moral laws. Finally society, or the community (acting always in modern times through the machinery of the State) orders and regulates all the principal forms of human association and largely regulates the intercourse of individuals by what we call law, in the strict sense positive law. Rules of positive law resemble all the laws we have previously noticed, in that they also represent a sequence of phenomena. A legal rule tells us what results are to attach to certain antecedent facts. Legal rules differ from the laws of nature and from economic or social laws in that the results are determined by man's will. They differ from moral laws in that the community (acting always in modern times through the machinery of the State) will, if necessary, secure the results it has decreed by resort to physical force (legal sanction). Many rules which govern the social life—the majority of the rules which govern the intercourse of individuals—are at the same time rules of morals and rules of law; but law and morals have each a distinct field. There are social rules which cannot be enforced by any but psychical penalties, and many more which it would be unwise to attempt to enforce by the ruder processes of the law; and there are many cases in which the social interest requires that a rule shall be established and enforced, but in which it is ethically immaterial what the rule shall be.

Of the rules which society enforces without or with the sanction of the State, a certain proportion is rather imposed upon society by its own organization than established by its own volition. In any given stage of social development there are numerous rules which appear to be essential to the existence of that particular form of social life. In all stages of social development we find certain fundamental rules (not very numerous), which appear to be essential to the existence of any social life. These fundamental rules have sometimes been described as 'natural law' (q.v.), and of all the uses of the term 'natural' in jurisprudence, this is perhaps the most defensible. It should be noted, however, that all these fundamental rules are primarily rules of morals; and that when they are recognized and enforced as rules of law, the mode of their enforcement, i.e. the positive law, may and does assume various forms. On the whole, therefore, it seems correct to relegate natural law to the field of morals.

DEFINITIONS. Of the numerous definitions of law (a very full collection is given by Holland, *Jurisprudence,* chs. ii. and iv.) one group emphasizes the close connection between law and morals (or right or justice, q.v.); a second group views law as a system of order, which assigns to each member of the community his place, his duties, and the limits of his free action; a third group notes especially the protection given to the individual by the limitations placed upon others, and describes the law as a system of liberty (i.e. of rights). A fourth group of definitions lays stress on the source of law, which is said by some to be the social will—a source from which other than legal rules proceed; and, by others, to be the State or the sovereign—a source from which only a part of the law proceeds, even in modern times. A fifth group finds the essential element of law in its sanction: either in the fact that the physical force of the community stands in the last instance behind the rules of the law, or in the fact that its rules are enforced by governmental agencies.

Early Custom and Law. The beginnings of law are found in social habit or custom. Custom is simply observance of precedents. Precedents are made by acts and forbearances. Whenever a power is exercised or a state of things is maintained by the community itself, or by individuals with the acquiescence of the community, a precedent is established. In early custom, religion, morals, and law are blended or imperfectly differentiated. Some of the rules of early custom, however, deal with matters which are regarded in modern times as legal, and of these quasi-legal rules some are enforced by physical coercion, the transgressor being lynched or sacrificed to the gods or expelled from the community (outlawry). Other violations of custom, which are not felt to be injurious to the whole community, are punished by the injured kinship-group or by the injured individual with the aid of his kinsmen (self-help, vengeance, feud). So long as such acts of redress or vengeance, although regarded as rightful, may lead to further retaliation, the sanction behind the rules of custom is still purely moral; but when the community begins to protect the persons who, in its opinion, have obtained due redress or taken rightful vengeance, these persons become in reality agents of the community, and the sanction behind the rules which they enforce may fairly be called legal. Self-help, thus ordered, meets the needs of early society in all cases in which the right to be enforced is clear, and its violation apparent, but it does not furnish any mode of settling controversies. This open place is filled by oaths, by ordeals, by arbitrations, and at last by authoritative judgments. (For the beginnings of jurisdiction, see Courts.) When courts are once established, custom gains not only an authoritative interpretation, but a development which, however slow, is far more rapid than was previously possible. Within the field over which the courts have jurisdiction, the growth of customary law is henceforth accomplished by decisions; its rules are found in the tradition or in the recollection or in the written record of judicial precedents. Popular custom is thus supplanted by judicial custom. In legal theory, however, precedents or decisions are not law, but only evidences of the law; and even when they are written, the law which is found in them is said to be 'unwritten.' This is still the theory of the courts as regards English common law, although it is well recognized that the common law is judge-made law.

Early legislation among many peoples is closely associated with jurisdiction; the law-finders are also the law-givers; and the law 'laid down' or 'set' (*lex, Satzung, Gesetz,* statute) is either a mere declaration of established custom or a judgment in advance on a question not yet settled by the decision of any actual case. There is, however, another root of early legislation, viz. the agreement of the community that it will in future observe a proposed rule. In both cases, however, the forms of law-giving and those of law-finding are frequently almost identical.

At what point of development early custom shall be regarded as law is substantially a dispute over words. The decision depends upon the definition of law. The Austinian definition of a law as a command emanating from a definite sovereign would include few rules of early custom; but those who find the essential element of law in the sanction will recognize in the most primitive custom a core of law.

Equity. With the establishment of judicial and legislative authorities, the factors that produce law in modern times are already operative. There is, however, an intermediate stage of development, noticeable both in Roman and in English legal history, which is known as equity. Neither the Roman prætors nor the English chancellors in developing new law laid down hard and fast rules, like legislators; they found law in the decision of single cases, like judges; but they did not regard themselves as bound by the precedents by which the administration of justice had previously been controlled. The new rules that were applied were not at first regarded as law, but rather as arbitrary assertions of governmental power. When, however, as happened both at Rome and in England, equity, following its own precedents, developed a new body of judicial custom, it was recognized that this custom was law. In England and in the United States equity is recognized as judge-made law, and it is often included in the term 'common law.'

Modern Legislation. In an advanced stage of social progress, legislation tends to become an increasingly important agency of legal development. A large part of the Roman Imperial law, however, even in its latest development, was still judge-made law or case-law; and in modern English-speaking countries not only does much of the law still rest upon judicial precedent (common law), but its development is still in the hands of the judiciary. The attempt in modern European States to put all the law into legislative or statutory form seems to be due to exceptional circumstances (see Civil Law and Code); and even in modern European law, although it is commonly denied that decisions make law, the persistent judicial practice (*jurisprudence, Gerichtsgebrauch*) by which open places in the written law are filled and new rules found to govern cases which the legislator could not, or at least did not, foresee, is practically treated as law.

Custom and Legislation in the Field of Public Law. Not only the relations of individuals and of private associations to each other, but also the organization of the State and of government, and the relations of the different branches of government to each other, are governed by law. This part of the law—constitutional law—is usually, until a comparatively late stage of political development, mainly customary. Acts and forbearances; the exercise of powers to which the community submits or limitations imposed upon power to which the government submits; contests between different branches of the government which end in a one-sided triumph or in reciprocal concessions—these are the precedents which make constitutional custom. In these matters the courts of justice have in most countries no jurisdiction; even in the United States they do not interfere in questions which they regard as political. At the present time nearly all civilized nations have written constitutions; but the development of these written constitutions is still carried on, as in former times, by the establishment of new customary law.

The methods in which governmental power may be exercised, the rights and duties of governmental officers, the relations between government and private persons—these matters are regulated by administrative law. This branch of the law, originally developed by the constant practice or custom of the government, becomes at a comparatively early period a subject of legislation; and in modern times controversies between the administration and private persons are regularly within the jurisdiction of the ordinary courts or of special administrative courts. Administrative legislation is therefore supplemented by judicial custom, i.e. by the customary interpretation of the courts. The customary practice of administrative agencies, however, has not ceased to be a source of administrative law.

International law, even in its most modern developments, is almost wholly customary. The precedents on which it rests are the acts and forbearances of independent governments in their relations with one another. It resembles national custom in a very early stage of development; for behind many of its rules there is only a moral sanction, viz. the moral sense of the civilized world. It is true that international law is now generally recognized as a part of the law of each State, and that its rules are enforced by each State against individuals; but against an offending State the ultimate remedy is still self-help and international feud, i.e. war; and it is not yet usual for neutral States to give more than moral support to the State that is waging a rightful war. The jurists who refuse to recognize early national custom as law are therefore obliged to deny that international custom is law in the strict sense of the word. Those, however, who find the essential characteristic of law in its sanction, point out that rules of international law may be, and sometimes are, enforced by the concerted action of the powers (joint intervention); and that any State which should persistently violate the rules of international law would assuredly be excluded from its benefits, i.e. it would be outlawed. There is also, in international relations, the beginning of legislative action in the form of general compacts (declarations of congresses); and there is the beginning of judicial decision in the growing practice of arbitration, and in the recent establishment of a permanent tribunal at The Hague to which international disputes may be referred.

Abrogation and Desuetude. That legislative rules are abrogated by repeal and by contrary legislation; that customary law is put out of force by contrary legislation, by change of custom, and by general non-observance (desuetude)—these facts are universally admitted. That legislation may lose its force and become 'a dead letter' by the development of contrary custom or by desuetude was affirmed by the Romans, but is generally denied by modern jurists. The history of law, however, is full of examples of the disappearance of written law in consequence of persistent non-observance; and even in modern times it is not difficult to discover statutes that have never been repealed or superseded, and are yet never enforced. When the administrative branch of government is independent of the legislative, laws that can be enforced only on the initiative of the administration may easily become dead letters by persistent administrative inaction; and this is particularly likely to happen when the law is not supported by public opinion.

Applications of Law: Persons and Places. Early law is tribal, i.e. the individual is subject to its authority and entitled to its benefits because of his membership in a tribe. With the formation of wider political associations, law becomes national. Under either system the stranger or foreigner is out of the law, unless its protection be extended to him through a member of the tribe or nation, or by virtue of a treaty.

Early law is also religious; it applies only to the members of a particular cult. Where many tribes have a common religion, the religious law may give a certain protection, within each tribe, to strangers of the same cult. Differences of religion are not found in early times among the members of a tribe; but with the formation of wider political unions different cults may be brought under a common sovereignty, and different rules may be applied to the adherents of the various cults. This is the case to-day in British India. In some of the European States, as late as the nineteenth century, Jews were allowed to live by their own law as far as their family relations were concerned; and in Austria, at the present time, divorce is refused to Catholics, although it is granted to non-Catholics.

The law of the modern State (which is sometimes, but not very appropriately, termed 'municipal' law) is strictly national only as regards political rights and duties, which are confined to citizens or subjects (nationals). In all other respects it is territorial; it governs all persons within the jurisdiction of the State, whether they are nationals or aliens. A few private rights are withheld in some countries from aliens, but in general the alien enjoys the same private rights as the national. An exception to the rule that law is territorial is found in the institution of exterritoriality (q.v.). In many cases, finally, the territorial law itself not only permits, but requires the application of foreign law by its own courts. See Conflict of Law.

Time. In general, of course, a rule of law which has ceased to exist ceases to be operative. Where, however, a legal relation has been established or a right vested, it would clearly be unjust that the relation should be dissolved or the right impaired by a change in the law. When such a case comes before the courts, it is therefore usually decided according to the provisions of the old law. This principle is usually stated differently: It is said that laws (i.e. new laws) are not retroactive. In Europe, where the legislature is not subjected to constitutional restrictions, the protection of vested rights is secured by a judicial presumption that no law is intended to be retroactive unless the legislature has expressly or by necessary implication so ordained. The Constitution of the United States, and many of our State constitutions, forbid the making of *ex post facto* laws (q.v.) or laws impairing the obligation of contract. See CONSTITUTIONAL LAW.

INTERPRETATION. The application of law involves its interpretation (q.v.). This is necessary not only in the case of written law, but also in the case of custom or unwritten law. Such law, indeed, exists only in its interpretation, i.e. the persistent judicial interpretation is the law. This is the case notably with our 'common law.'

KINDS OF LAW: CLASSIFICATION. All law may be divided into two classes: substantive law and adjective or remedial law. Substantive law defines the normal relations of social life; adjective or remedial law defines and deals with abnormal conditions, with violations of the legal order. Substantive law is divided and subdivided according to the character of the relations with which it has to do. Public law is concerned with the State and with government, and with relations to which the State is a party; private law, with private persons and the relations between them. Public law is subdivided, as has already been noted, into international, constitutional, and administrative law. Private law classifies persons (natural and artificial or juristic) according to their legal capacity, and it deals with things as the objects of private right. The principal groups of private relations are property, family, and succession. In the field of property law we distinguish the law of things, the law of debts or obligations (contracts and quasi-contracts), and the law of monopolies (copyrights, patents, etc.). Family law includes the relations of husband and wife, parent and child, guardian and ward. (The law of master and servant once belonged in the law of the household; with changed social relations it has passed into the law of contractual obligations.) The law of succession has to do with what may be called a normal disturbance of property relations; it provides for the continuance and readjustment of the property relations to which a deceased person was a party. When this readjustment is effected in accordance with the will of the decedent, we speak of testamentary succession; when it is effected by the law in the absence of any validly expressed will of his, we speak of intestate succession; in so far as it is effected by the law in spite of his will, we speak of necessary succession (law of statutory shares). In the civil law the distinction between immovables and movables is confined to the law of things. In the English law the distinction between real and personal property runs through the law of family (as far as property relations are concerned) and the law of succession, and divides each into distinct parts or branches.

Adjective or remedial law, which deals with abnormal conditions, provides for the reëstablishment of the normal order, when this is possible; for the indemnification of the persons who have suffered injury; and for the punishment, in person or in purse, of the individuals by whose fault the normal order has been disturbed. Remedial law includes not merely the processes of punishment and redress — administrative procedure, criminal and civil procedure—but also the body of rules which define and classify offenses and provide penalties. It thus includes the law of crimes and the law of torts (q.v.). Some writers treat the law of crimes and that of torts as substantive law, placing the former in public, the latter in private law; but these branches of the law do not deal with normal relations, nor does criminal law deal merely with violations of the political order; it provides sanctions which extend over every part of the private law. International law has its remedial as well as its substantive side; it consists of the law of peace and the law of war.

While the distinction between substantive and remedial law is both logical and convenient, it is formal rather than essential. Substantive and remedial law attain the same end in different ways. Social relations are ordered by fixing the limits of permissible action; and these may be fixed as well as by stating what no one may do and by punishing the doer as by stating what one may do and protecting the doer. Historically the former method is the older; rights are felt before they are formulated, and they are gradually defined by the successive repulse of different invasions. Even in modern law there are rights that are recognized in remedial law, but have not yet obtained substantive expression. For example, the individual has a right over his own person which is analogous to (although by no means identical with) ownership of a thing; and this right, although recognized in the prohibition and punishment of homicide, assault, illegal imprisonment, etc., is nowhere defined in substantive law.

GRADES OF LAW. In every State we find legal rules of greater or more general authority and legal rules of inferior or more restricted authority. Where law-making power is delegated to (or has never been wholly taken from) the executive, it is customary to speak of the rules laid down by the executive as orders, regulations, or rules. Municipalities have also a restricted power of legislation; and the acts of their legislative bodies are commonly termed ordinances. Where a limited power of making rules is granted to a private association, we call its rules by-laws. Within their respective fields, executive orders, ordinances, and by-laws, although not commonly termed laws, are as truly laws as the acts of a national or State legislature.

The number of classes or grades of law is increased in federal States by the coexistence of law-making power in the nation and in its component parts. If in considering the different grades of law which exist in the United States we include unwritten law, we obtain the following series:

I. FEDERAL LAW. A. *Constitutional.* (1) The Constitution of the United States, and the amendments thereto. (2) The custom of the Constitution, as settled by the acts and forbearances of the Executive and of Congress. (3) The interpretation of the Constitution by the Federal courts. B. *Ordinary.* (1) Acts of Congress. (2) Treaties. (3) Executive orders and regulations. (4) Interpretation of acts of Congress, treaties, and executive regulations by the Federal courts.

II. STATE LAW. A. *Constitutional.* (1) The State constitutions and the amendments thereto. (2) The interpretation of the State constitutions by the State courts. B. *Ordinary.* (1) Acts of the State Legislatures. (2) Decisions of the Federal courts in matters not governed by Federal law. (In cases not governed by Federal law, the Federal courts nominally apply State law; but in the absence of written law, they interpret the common law as they see fit: so that, as far as their jurisdiction extends, their decisions have developed a uniform common law for all the States.) (3) Decisions of the State courts, construing the acts of the Legislature and interpreting (i.e. developing) the common law. (4) Executive orders and regulations. (5) Municipal ordinances. (6) By-laws of corporations and other associations.

The development of a Federal custom of the Constitution (I. A 2) has been necessitated by the difficulty of amending the written Constitution. The absence of any corresponding custom in the States is explained by the ease with which the State constitutions are amended. The interpretation and development of the common law by the Federal courts (II. B 2) may in one sense be termed Federal law, but this law is superseded by acts of the State legislatures.

For bibliography consult the authorities referred to under JURISPRUDENCE, CANON LAW, CIVIL LAW, CONTRACT, CORPORATION, EQUITY, EVIDENCE, PLEADING, TORT, etc.

LAW. A term of science and philosophy, there used in a metaphorical sense. The primary meaning of the word 'law' is written enactment or rule of action laid down by authority. Such law, when enforced by authority, secures a certain uniformity of action. The observed uniformity of action of physical objects thus presents a striking resemblance to the conduct of law-controlled human beings. This resemblance was without doubt the logical ground for the belief, which appeared in the earliest known times, that the course of nature is prescribed by enactment of a conscious being or of several such beings. Such a view comes to fullest expression in later Semitic literature. "He gave to the sea his decree, that the waters should not pass his commandment." "Hitherto shalt thou come, but no farther: and here shall thy proud waves be stayed." Against this view protests have been raised for many centuries, but it is only within quite recent times that a less anthropomorphic and more scientific view of the uniformity of natural processes has gained wide currency. According to this view, the 'law of nature' is not an enactment expressing the will of some conscious being and obeyed by natural objects, but only the mere fact that all events have causes (see CAUSALITY); and causes of events are not unaccountable entities in some way producing effects by some sort of creative magic, but nothing more nor less than the invariably uniform antecedents of those events. Ever since Hume's trenchant criticism of such words as 'force' and 'power,' it has come more and more to be seen that nothing is explained by referring effects to the power of causes to produce effects. To attribute the order of nature to the power of some great being who can lay down the law to nature is to explain a fact by a mystery. Science gains nothing, therefore, by ascribing all the uniformities of nature to the determining decree of a supernatural being. The power of such a decree to produce an effect is no more self-explanatory than any causal efficiency of any physical object. Descartes and his school, and also modern parallelists (see PARALLELISM), assert that while physical phenomena may cause other physical phenomena, and psychic phenomena may cause other psychic phenomena, there is no possible interaction between phenomena of the two different classes. See OCCASIONALISM.

Laws of nature, whether physical, psychical, or psycho-physical, are of different orders or grades. Some observed uniformities are particular instances of more extensive uniformities obtaining in many *prima facie* diverse phenomena. For instance, the divergence of the motions of the earth and of the moon from a straight line was successfully correlated by Sir Isaac Newton with the phenomena of falling bodies nearer the earth's surface. And inasmuch as not only the motions of the earth and of the moon accord with this law, but also the motions of all the planets and of such comets as have been carefully studied, all these uniformities are correlated in the so-called law of gravitation, which is by hypothesis conceived as obtaining among all physical objects within the universe. In this law of gravitation we have perhaps the best instance of what is called a *scientific* law—i.e. a law which can be stated with accuracy, and to the universality and unconditionality of which all available evidence points with all the assurance of valid logical induction.

But not all discovered laws have this logical conclusiveness. Many of them are merely rough generalizations. The exact conditions under which a phenomenon occurs may not yet have been ascertained, and still we may know that under certain general circumstances, not all of which are sufficiently defined, that phenomenon does actually and frequently occur. Take for instance the facts of heredity. We know that if there have been in several successive generations many criminals in a certain line of descent, other criminals will probably appear when the present representatives of that line begin to reproduce. But we are not in a position to state the exact conditions under which this further criminality will be sure to appear. Some of the children may escape the taint altogether; some may have tendencies toward criminality, but not too strong to be overcome by proper social influences; while still others are practically incorrigible. Here then we have an instance of a more general law of heredity, which may be stated in the proposition that psychical and physical characteristics of children are more or less conditioned by the psychical and physical characteristics of their parents and of more remote progenitors. Observe the more or less in the statement. There is no such qualification in the law of gravitation. Hence while the latter is a law in the strictest scientific sense of the term, the law of heredity is a law only in a very loose sense. Such laws are called *empirical* laws. Experience suggests the existence of a causal connection, but science has not yet succeeded in isolating and defining the relation. Empirical laws are the raw material from which scientific laws are elaborated by exact observation, by experiment, and by more guarded generalizations, and especially by correlation with other laws with which they may be related as particular to particular under a common universal. J. S. Mill's account of empirical laws differs somewhat from that just given, but it is really the starting-point of more recent investigations into the differences between scientific and empirical laws. On this account, it is worth while to quote it: "Scientific inquirers give the name of 'empirical laws' to those uniformities which observation or experiment has shown to exist, but on which they hesitate to rely in cases varying much from those actually observed, for want of seeing any reason *why* such a law should exist." Consult, especially, Mill's *Logic*, book iii.; but also the other works on inductive logic referred to under Logic, and Induction.

LAW. In social psychology (q.v.), law is closely related to custom. When it becomes necessary to enforce a custom, to make it compulsory, to prescribe penalties for its infraction, the custom is transformed into a law. Thus the custom of dividing the spoils of battle may become subject to such serious lapses that the welfare of the clan or tribe is imperiled. The general welfare will then demand that an authoritative rule be made and protected by sufficient penalties. Custom has its own sanctions, as well as law; but it lacks the authority and physical coercion that distinguish law.

It is evident that custom, which is closely related to habit (q.v.), is older than law. In the simpler forms of civilization 'law and order' are upheld solely by usage and custom. It is natural that law should first apply to those lines of conduct whose importance is too grave to allow them to be left to custom. The primitive law, or rule, with its external, physical compulsion, is of much earlier origin than written regulations, which demand not only a somewhat advanced stage of social development, but also a high degree of stability in a society. Law appears only with some form of the State. So long as there is no general legislative and executive power that makes the State, it is obvious that law cannot be differentiated from custom. It is, then, a mistake to suppose that some kind of legal contract is prior to the State. The State arose from the tribal union as law arose from custom; both grew up gradually and side by side.

Consult: Wundt, *Ethics*, translation, vol. i. (New York, 1897); Lubbock, *Origin of Civilization* (New York, 1895).

LAW, Canon. See Canon Law.

LAW, Criminal. That branch of public law which relates to crime or public wrongs; that is, wrongs or injuries by individuals against the State or sovereign as distinguished from injuries by individuals against others, which are dealt with by the private law of wrongs or tort. All civilized systems of law now agree in drawing this distinction between public and private wrongs. It seems probable, however, that in primitive communities the law of crime had its origin in, or at least was preceded by, the law of tort, and that the consequence of the various acts of violence now recognized as crimes was that they gave rise exclusively to an obligation to the injured person or his representative which might be satisfied by the payment of money. Under the early Anglo-Saxon law, which corresponded substantially in this particular with other ancient systems of law, "A sum was placed on the life of every free man according to his rank and a corresponding sum on every wound that could be inflicted on his person, for nearly every injury which could be done to his civil rights, honor, or peace; the sum being aggravated according to adventitious circumstances." (Kemble, *Anglo-Saxons*, i. 177.) (See Blood-Money; Wergild, etc.) The earliest recognition in ancient law of distinct wrongs against the State appears in the isolated acts, legislative in character, by which the State avenged itself for wrongs done in the same manner that private individuals were permitted under sanction of law to avenge or requite themselves for private wrong which may be regarded as a prototype of public wrongs.

From these occasional legislative acts by which the State avenged itself upon the criminal for wrongs suffered by it, it was a natural though gradual transition to a system by which this particular function was delegated to a permanent commission still legislative rather than judicial in character, whose duty it was to investigate and punish public wrongs, and finally to the more modern system under which a permanent tribunal wholly judicial in character defines and applies the law relating to crime. The history of *Curia Regis* or King's Court, which was the combined legislative, administrative, and judicial body under the Norman Kings, shows these successive stages of development in our own criminal jurisprudence. The Court of King's Bench, which was the criminal branch of the King's Court, was organized in the reign of Edward I. (1274-90). It follows from the character of all public wrongs that the first essential of a crime is some act which, because of its effect upon the community, is deemed an offense to the State. This may happen either: (a) because the act is directly an injury to the State; or (b) because the act is a direct interference with the performance of some duty, as of protecting the life, property, safety, and morals of citizens, which, upon grounds of public policy, the State has assumed.

For the discussion of the elements of a crime, and of criminal intent, etc., see such titles as Crime; Attempt; Intent; Mistake, etc.

Crimes may be conveniently classified as follows: (a) offenses against government; (b) offenses against public peace and health; (c) offenses against religion and morality; (d) offenses against persons; (e) offenses against the dwelling-house; (f) offenses against property; (g) maritime offenses. At common law also crimes were classified as felonies and misdemeanors, and the distinction has been preserved to some extent by the modern law and the various criminal codes. See Felony; Misdemeanor.

The Law of Criminal Procedure. The first step toward placing one charged with crime upon his trial is necessarily his arrest. (See Arrest.) After the arrest the prisoner must be brought for examination before the magistrate, who may hold him for the action of the grand jury, or, if an indictment has already been found, may hold him for trial before a petit jury. Pending trial the prisoner is committed to jail, unless admitted to bail. See Bail.

The method of finally accusing one with the commission of a crime is by indictment by the grand jury, which may either precede or follow the arrest. (See Jury; Grand Jury.) The indictment is the final pleading corresponding to the declaration or complaint in a civil action, which sets out all of the essential elements of the crime and all facts necessary to give the court jurisdiction to try the prisoner for the offense charged. (See Indictment.) Upon the trial the indictment must be read to the accused, and he is then given opportunity to plead to it. The prisoner may demur to the indictment on the ground that it is in law insufficient in force or substance. (See DEMURRER.) He may plead in abatement, setting up any facts showing want of jurisdiction in the court or other reason why he should not be placed upon his trial; he may also plead a former conviction or acquittal.

If the prisoner is unsuccessful upon his demurrer or the pleas already referred to, he must plead to the merits by a plea of either guilty or not guilty. A plea of guilty in effect admits the charge and is equivalent to a conviction after trial. A plea of not guilty puts in issue the indictment and places the prisoner upon his trial before a jury. (See JURY; PLEADING; TRIAL.) Upon verdict of the jury of not guilty the prisoner must be discharged. If the jury fails to agree upon a verdict the prisoner may again be placed upon trial before a new jury, or if the verdict be guilty he must be sentenced to undergo whatever penalty the law provides for the crime. (See PUNISHMENT.) Before sentence the prisoner or his counsel may move to arrest the judgment because of some material error in the proceedings appearing on the record, or he may move to set aside the verdict because not supported by the evidence, or because of newly discovered evidence. Upon denial of this motion the prisoner may be sentenced, the sentence being the judgment of the court fixing and directing the punishment of the prisoner according to law.

The English common law of crime has been adopted in most of the States of the United States, with some statutory modification and addition. In a few States the criminal law has been codified, and it is thus in these jurisdictions entirely statutory. The law of procedure, while substantially changed by statute in all of the States in matter of form, varies in no important particular from the substance of the procedure at common law which has here been outlined.

As the several States upon the formation of the Federal Union retained their jurisdiction over crime, the Federal Government has no common-law jurisdiction over crime, nor can it have any statutory jurisdiction over crime except over such crimes as in some way interfere with the power delegated to it in the Constitution by the several States, including such as arise in territory subject to its exclusive jurisdiction. For a discussion of the elements of a crime, of the place where a crime is punishable, and other matters affecting the liability, trial, defense, and punishment of crime, see such topics as ATTEMPT; JEOPARDY; JUSTIFICATION; JURISDICTION; JUDGMENT; PRINCIPAL, etc.

For a discussion of particular offenses against a government, see TREASON; BRIBERY; EXTORTION; CHAMPERTY; MAINTENANCE; BARRATRY; EMBRACERY; CONTEMPT; PERJURY; RESCUE; PRISON BREACH; AFFRAY.

For offenses against public peace and health, see AFFRAY; RIOT; FORCIBLE ENTRY; LIBEL; SLANDER; ENGROSSING; FORESTALLING.

For crimes against religion and morality, see BLASPHEMY; ADULTERY; BIGAMY; SEDUCTION; ABDUCTION; ABORTION; FORNICATION.

For offenses against the person, see ASSAULT; BATTERY; MAYHEM; HOMICIDE; MANSLAUGHTER; MURDER; FALSE IMPRISONMENT; RAPE; ROBBERY.

For offenses against the dwelling-house, see ARSON; BURGLARY.

For offenses against property, see LARCENY; EMBEZZLEMENT; FALSE PRETENSES; MALICIOUS MISCHIEF; RECEIVING STOLEN GOODS; FORGERY; COUNTERFEITING.

For maritime offenses, see PIRACY; BARRATRY.

Consult the authorities referred to under CRIMINAL LAW; JURISPRUDENCE; CONSTITUTIONAL LAW; and many of the titles above referred to.

LAW, FEUDAL. See FEUDALISM.

LAW, MARTIAL. See MARTIAL LAW.

LAW, MILITARY. See MILITARY LAW.

LAW, MUNICIPAL. See MUNICIPAL LAW.

LAW, EDMUND (1703-87). An English prelate and metaphysician, born at Cartmel, Lancashire, and educated at Saint John's, Cambridge. He was for nine years (1737-46) rector of Greystoke, Cumberland; became Archdeacon of Carlisle in 1743, and master of Peterhouse in 1754; and in 1768 was elected Bishop of Carlisle. Among his works, which are marked by painstaking investigation and freedom from dogma, are: *An Enquiry into the Ideas of Space and Time* (1734) and *Considerations on the Theory of Religion* (1745; and later with a biographic sketch by Paley).

LAW, EDWARD. See ELLENBOROUGH.

LAW, JOHN (1671-1729). A celebrated financier and speculator, born at Edinburgh, April 21, 1671. His father was a goldsmith and banker, and proprietor of the large estate of Lauriston, near Edinburgh. Law early showed a most remarkable talent for mathematics, and after the death of his father he removed to London, where he was soon prominent both in financial and social circles; but his life was a dissipated one, and in 1695 he was compelled to flee from England in consequence of a duel in which he killed his adversary. After visiting France and Italy, he went to Amsterdam and spent his time in studying the credit operations of the bank, where he was employed for a short time. About the year 1700 he returned to Edinburgh, a zealous advocate of a paper currency; but his proposals to the Scottish Parliament on this subject met with an unfavorable reception. He visited different parts of the Continent, where he won large sums by gambling, but sought in vain to win the favor of governments to his banking schemes, which were outlined in a pamphlet advocating a State bank with paper notes. At last in 1715 he settled in Paris, and in company with his brother William set up in 1716 a private bank, which was chartered by the Government, and which was soon successful and prosperous to such an extraordinary degree that in 1718 the Duke of Orleans, the Regent, was persuaded to adopt Law's plan of a national bank. The new institution issued prodigious quantities of bank-notes, which at first enjoyed perfect credit, while the ordinary national bonds remained, as they had long been, at a price far below their nominal value. In 1717 Law originated his famous Mississippi Scheme (q.v.), for the purpose of raising money to meet the exigencies of the State. The Compagnie d'Occident was established, with liberty to exploit the region about the Mississippi. It soon absorbed the French East India Company and other trading companies, being transformed into the Compagnie des Indes. The public were invited to invest in the shares of this company, and an extraordinary speculative mania resulted, which drove up the value of the shares to an almost fabulous height. For a time it seemed as if the Mississippi Scheme would more than fulfill its promises, and the company, which undertook the payment of the debts of the Government, was charged with the receivership of the taxes. In the meanwhile the country was flooded with paper money, and in 1720 a general financial collapse ensued. Law, who had been made Councilor of State and Comptroller of Finances just before the crash came, thought it prudent to quit France. He proceeded first to Brussels, and then to England, where he remained for several years, but finally settled in Venice, where he managed to maintain himself by gambling, and died there, March 21, 1729. Law appears to have remained a firm believer in his theories regarding public credit and currency. A complete edition of his works, translated into French, was published at Paris in 1790, and reprinted in 1843. They have since been inserted in Guillauman's collection of the writings of the chief economists and financiers of the eighteenth century. Consult, for Law's life and theories of banking: Wood, *Memories of the Life of John Law* (Edinburgh, 1824); Mackay, *Memoirs of Extraordinary Popular Delusions* (London, 1850); Thiers, *Law et son système des finances* (Paris, 1858; Eng. trans., New York, 1859); Perkins, *France Under the Regency* (New York, 1892); Heymann, *Law und sein System* (Munich, 1853); Levasseur, *Recherches historiques sur le système de Law* (Paris, 1854); Joheg, *Une préface au Socialisme, ou le système de Law* (Paris, 1848).

LAW, John (1796-1873). An American jurist, born in New London, Conn. He was descended from a line of lawyers including Jonathan Law, Chief Justice of the Connecticut Supreme Court (1741-50). Educated at Yale, he was admitted to practice in 1817, and soon afterwards emigrated to Indiana, and made his home at Vincennes. He was successively prosecuting attorney, member of the State Legislature (1823), again district attorney, a judge for eight terms, and in 1838 was appointed receiver of public moneys. In 1851 he moved to Evansville, and was one of the founders of the town of Lamasco; four years afterwards he was appointed judge of the Court of Land Claims; and in 1860 he was elected to the House of Representatives, and served in the Thirty-seventh and Thirty-eighth Congresses on committees on library, agriculture, and Revolutionary pensions. His address on the *Colonial History of Vincennes* was published in 1839 and in 1858. He was president of the Indiana State Historical Society.

LAW, William (1686-1761). An English devotional author. He was born at King's Cliffe, Northamptonshire; and was educated at Emmanuel College, Cambridge, where he took his degree of M.A. in 1712. He was a strong Tory sympathizer and refused to take the oath of allegiance on the accession of George I. His writings are deeply tinged with mysticism, and in later life he was a follower of Jakob Böhme. His *Serious Call to a Devout and Holy Life* (1729) first awakened the religious sensibilities of Dr. Johnson, who speaks of it in high terms. The Wesleys also derived much advantage from it, and became intimate with Law, but later rejected his teachings. His other writings include: *Remarks Upon Mandeville's Fables of the Bees* (published 1724; republished with an introduction by Maurice, 1844); *The Absolute Unlawfulness of the Stage Entertainment Fully Demonstrated* (1726); letters to the Bishop of Bangor (1717-19); and some very able attacks on the rationalism of his day. His collected works were published in London in nine volumes in 1762. Consult Overton, *Law, Nonjuror and Mystic* (1881).

LAWES, lạz, Henry (1596-1662). An English musician. After studying music under John Cooper, he was sworn in as gentleman of the royal chapel of Charles I. (1625), where he soon gained celebrity as a composer of music for masques and songs. Of the former the most important was Milton's *Masque of Comus*, which was under his personal direction and was set to music and produced at Ludlow Castle in 1634. Milton, who was probably his pupil, refers to him in highly eulogistic terms in several of his poems. His music, although written in the Italian style, was decidedly original, and was also highly praised by Waller, Herrick, and Phillips, whose songs he had done much to popularize. A strong Royalist, he was appointed a member of the King's Band, and subsequently Clerk of the Cheque. During this period (1625-62), in addition to composing the anthem for the coronation of Charles II. in 1653, he published *Ayres and Dialogues for One, Two, and Three Voices*. He was buried in the cloisters of Westminster Abbey. An elder brother, William Lawes (c.1582-1645), was also attached as a musician to the royal chapel, and was associated with him in some of his musical undertakings. This brother, who was killed at the siege of Chester, composed a portion of the music for the *Choice Psalmes*, published in 1648.

LAWES, John Bennet (1814-1900). A celebrated English agricultural chemist, born at Rothamsted, Hertfordshire. He was educated at Eton, Oxford, and London, entered upon the management of the paternal estate of Rothamsted in 1834, and three years later commenced experiments with plants grown in pots of soil. He early discovered a process for transforming bone into superphosphate by the use of sulphuric acid, took out a patent in 1842, and built up an extensive business which he managed for about thirty years. In 1867 he engaged in the manufacture of tartaric and citric acids, and continued in this business until his death. The experimental inquiries at Rothamsted were enlarged in 1843 by the employment of Dr. (afterwards Sir) J. H. Gilbert to superintend the laboratory work. For more than fifty years Lawes and Gilbert conducted elaborate agricultural investigations. The field experiments were enlarged and systematized until they occupied nearly forty acres in 1856. Experiments with animals were begun in 1847, and a variety of problems in animal nutrition have since been studied. In 1889 Sir John transferred the laboratories and experimental fields of Rothamsted to a board of trustees with an endowment of about £100,000, thus insuring the continuance of the investigations. At this time he made provision for a biennial course of lectures in the United States on the Rothamsted work. Accounts of the Rothamsted work may be found in the *Journal* of the Royal Agricultural Society of England, *Reports* of the British Association for the Advancement of Science, *Proceedings* and *Transactions* of the Royal Society of London, *Journal* of the Horticultural Society of London, and *Memoranda* of the Rothamsted Station.

LAW MERCHANT. Originally, the body of rules governing the various communities of merchants throughout Europe, and administered by piepowder courts (q.v.), staple courts, and merchants' courts (q.v.). The procedure of the law merchant as well as the substantive rules differed widely from those of the early common law. Its courts were expeditious, seeking not only to do justice, but to do it speedily. Judges for these tribunals were selected because of their knowledge of the law merchant, and were bound to administer that law, and not the common law of the land, nor the peculiar legal usages of the cities, towns, or boroughs where they sat. During the seventeenth century the courts which specially administered this body of law died out in England, and their jurisdiction was assumed by the common law and equity tribunals of the realm. From this time to the accession of Lord Mansfield as Chief Justice, the term 'law merchant' was employed in quite an indefinite sense. The common-law judges and juries were not versed in the legal usages of merchants. When mercantile controversies came before them, it was often necessary to call merchant witnesses to prove what the law merchant applicable to the particular case was, although at times the mercantile custom involved was so notorious that courts would take judicial notice of it.

The third period in the history of the law merchant in England embraces the latter half of the eighteenth century and most of the nineteenth. Lord Mansfield conceived that the usages of merchants in all countries rested upon the same general principles, and that the law merchant was a branch of the *jus gentium*, or law common to all nations. As Chief Justice he devoted his great energies to the development of a body of legal rules which should be based not on the common-law doctrines of England, but upon principles which commercial convenience, public policy, and the customs and usages of merchants had contributed to establish, with slight differences, over all Europe. In the United States his work was carried forward by Chancellor Kent, Justice Story, and others. As a result of the movement the law merchant and the common law are no longer distinct and separate bodies of legal rules. To a large extent they have become amalgamated, and are administered by all legal tribunals as a single system. At the present time, therefore, 'law merchant' does not designate a true body of law, as it did formerly, but is applied to various branches of English law, in which the old usages of merchants still survive to a considerable extent, or which have sprung out of modern business needs and customs, such as *agency, bailments, insurance, partnership*. Consult the authorities cited under those titles; also: Smith, *Compendium of Mercantile Law, Macdonell's Introduction* (London, 1890); Scrutton, *The Elements of Mercantile Law* (London, 1891); Burdick, *The Essentials of Business Law* (New York, 1902); "What is the Law Merchant?" (2 *Columbia Law Review*, 470, 1902); "The Early History of the Law Merchant in England," xvii. *Law Quarterly Review*, 232, 1901.

LAWN (older forms *lawnd, laund*, OF. *lande, launde*, Fr. *lande*, heath, from Ir. *land*, OWelsh, Bret. *lann*, Corn. *lan*, open space; ultimately connected with Goth., AS., Eng. *land*, OHG. *lant*, Ger. *Land*, land). A smooth, even, well-kept turf or greensward, intended solely for ornament and pleasure. The hot and dry summers which frequently prevail in the United States are injurious to grass; but as the lawn is usually limited in extent, this obstacle is overcome by controlling the moisture conditions. Good velvety turf can be maintained in moderately dry climates, even in times of intense and prolonged heat and drought by daily supplying the necessary moisture. In no instance is the condition of the soil a more important factor than in lawn-making. The best soil for this purpose is a sandy loam of fine texture with a clay subsoil, the most favorable combination for either wet seasons or times of drought. A clay soil bakes too readily, and an open sandy or gravelly soil is not sufficiently resistant of drought. Before the soil is prepared to receive the grass-seed, it is drained if it has inadequate natural drainage, and then graded to give it the desired contour. The ordinary dooryard lawn is usually level, but the extensive lawns of parks combine in their contour the level, the convex, and the concave, gracefully merging into each other.

The preparation for the grass-seed consists in working the soil with the plow and subsoiler or the spade to a depth of at least one foot. All stones and rubbish are removed to obtain a clean, fine, and well-tilled seed-bed. A rich soil is essential, and the land for a lawn should be enriched by heavy applications of well-rotted barnyard manure or when the manure cannot be obtained by a heavy dressing of commercial fertilizers. A complete commercial fertilizer, i.e. a fertilizer containing nitrogen, phosphoric acid, and potash, is used and liberal quantities of lime and bone-meal are worked into the soil in addition. The selection of grasses is determined by the climate of the locality, and the color, texture, and sod-forming habit of the different species. The most common grasses combining the qualities of a lawn-grass to a greater or less extent are Kentucky blue-grass, fescue grass, bent grass, Saint Augustine grass, and Bermuda grass. The finer varieties of fescue and bent grasses form an especially soft and elastic turf, qualities highly esteemed in a lawn. Saint Augustine grass and Bermuda grass are well adapted to warm climates, and are extensively used as lawn-grasses in the Southern United States. In order to obtain evenness in the texture of the turf and the color of the lawn, it is customary to sow only one kind of grass. Mixtures of different grasses, however, are also frequently used. A light, scattered stand of white clover is often considered desirable. The grass-seed is sown thickly, from 50 to 60 pounds being used per acre. Care should be taken not to introduce weed-seeds in the manure or with the grass-seed. The time of seeding depends upon the climate and the prevailing weather. The seed should be sown when the conditions for its growth are the most favorable. Moisture is an absolute requirement, and for this reason sowing shortly before an expected rain is the common practice. Windy weather prevents the even scattering of the seed. In general, sowing is done during the moist months of spring, but where conditions permit in the early fall. After the soil has been made perfectly smooth and fine, the seed is scattered evenly over the surface and thinly covered with a fine-toothed iron rake, followed by an iron roller. To avoid covering the seed too deeply, the land is sometimes rolled without the previous use of the rake.

Small grass-plats are often covered with transplanted turf instead of beginning with the seed. When the grass has grown several inches high, mowing with the lawn-mower is begun and repeated at short intervals. Frequent mowing and rolling improves the turf. During dry summers, when there is danger of exposing the roots to the drying action of the hot sun, too frequent mowing is injurious. The lawn should be rolled at least once each spring when the weather is moist, for the purpose of compacting the turf. To keep up the fertility of permanent lawns, land plaster, nitrate of soda, and hardwood ashes are applied as top dressings in the spring or a dressing of fine compost is applied in the fall. Consult *United States Department of Agriculture Year-Book,* 1897 (Washington, 1898).

LAWN TENNIS. A modern game resembling in some respects the ancient game of tennis (q.v.), which in its earliest form seems to have been played in the open air. The new sport originated almost simultaneously in England and America. Major Wingfield reduced it to a definite form in England in 1874, giving it the hopelessly classical name of 'sphairistike.' Under the auspices of the Marylebone Club, rules were formulated the following year for what was then definitely known as lawn tennis. The 'hour-glass' court was retained, with the net five feet high at the posts and four feet in the centre, and the service lines 25 feet from the net, with covered balls 2½ inches in diameter and 1½ ounces in weight. Before 1876 the earliest form of court was replaced by a rectangular one, 26 yards long by 9 yards wide, the net being lowered to 3 feet 3 inches and then to 3 feet in the centre, and the service-line brought 4 feet nearer the net. In 1879, when volleying was introduced by the Renshaw brothers, the service-line was brought one foot nearer the centre, and the height of the net raised again to 3 feet 6 inches, making the advantages of the different styles of play more equal. In 1887 the (English) National Lawn Tennis Association was formed. From that time on it has been the governing body for England and the neighboring countries, into which the game has spread. The courts of all countries have the same dimensions; the following is the official description of the American court: The court is 78 feet long and 27 feet wide. It is divided across the middle by a net, the ends of which are attached to two posts, standing 3 feet outside of the court on either side. The height of the net is 3 feet 6 inches at the posts, and 3 feet in the middle. Half-way between the side-lines, and parallel with them, is drawn the half-court line, dividing the space on each side of the net into two equal parts, the right and left courts. On each side of the net, at a distance of 21 feet from it, and parallel with it, are drawn the service-lines. Two kinds of game are played: 'singles,' i.e. one person against another; or 'doubles,' two partners on each side. The choice of sides of the court and the right to serve first are decided by toss. The players stand on opposite sides of the net, the player who first delivers the ball being called the server, and the other the striker out. At the end of the first game the striker out becomes the server, and so on alternately. The server delivers the ball or service from the right to the left courts. It must drop between the service-line, half-court line, and side-line of the court, diagonally opposite to that from which it was served. The system of scoring is framed on a basis of fifteen for each stroke won; but the third stroke is called forty instead of forty-five. If both players win three strokes, the score is called 'deuce' instead of forty all. The winner of the next stroke scores 'advantage,' and if he also gets the following stroke, he wins the game; if the stroke falls to the opposite side, the score goes back to 'deuce.' Similarly the player who first scores six games wins the set, unless both should have won five, when a player must win two consecutive games to score the set. If he fails to do this, the score is once more called 'games all,' and the same conditions prevail as before. The players change sides at the end of every set. All championship matches have since 1886 been determined by the winning of three sets out of five; but since 1897 the English system of handicapping occasionally has been employed, but without the use of differential tables. Briefly, a player is benefited by giving or owing strokes or giving bisques. A bisque is one point which can be taken by the receiver of the odds at any time in the set, except after a service is delivered or by the server after a fault. The game was played in America within a year of its adoption in England—at Nahant, near Boston. The next year a court was laid out at Newport, R. I., which has been the American headquarters of the game ever since, although it has grown to such an extent that, in addition to national championships, there are yearly held 26 championship contests by single States or groups of States. The first open championship was held on the grounds of the Staten Island Cricket Club in 1880. The next year the United States National Lawn Tennis Association was formed, and rules adopted which have, however, been modified and altered from time to time, and since then the national championships have always been played at Newport, R. I. English players have frequently taken part in them, with marked success at first, which gradually diminished as the American play developed along national lines. These may be summed up under these heads: (1) The screw service whereby the ball is made to curve in its downward flight (like the 'out-drop' of a modern baseball pitcher) imparting a double and most baffling motion; (2) the practice of volleying from a position so close to the net that these strokes can kill the ball; (3) the development of the 'stop volley,' whereby the ball is simply stopped with a loosely held racket and falls over the net 'dead'; (4) the development of 'lobbing' to a wonderful extent, lobbing very high with a slight cut that gives the ball a back twist. The American Association has recently modified one of the two important differences between the rules of play in England and America by limiting the rests to which players were entitled between sets, to one rest after the third set, and no more. The other difference, the foot-fault rule, remains.

LAW'RENCE. A city and the county-seat of Douglas County, Kan., 40 miles west by south of Kansas City; on both sides of the Kansas River, and on the Atchison, Topeka and Santa Fé and the Union Pacific railroads (Map: Kansas, G 3). The city is well laid out, with wide streets, and has many attractive buildings. It is the seat of the State University (see KANSAS, UNIVERSITY OF), founded in 1866 on Mount Oread, and of the Haskell Institute, a United States Government Industrial School of Indians, which occupies a site of 600 acres. Bismarck Grove, a park including 240 acres, is only a short distance outside the city limits. Lawrence is important as a commercial centre, and its manufacturing interests, which are considerable, are promoted by excellent water-power. The industrial establishments include flouring and paper mills, sash and door factories, a foundry and machine-shop, wire-fence and nail works, and a large creamery. Lawrence (named in honor of Amos A. Lawrence) was the first of the 'free-State' towns founded by the Emigrant Aid Society in 1854, immediately after the passage of the Kansas-Nebraska Bill (q.v.), and was for several years the headquarters of the Anti-Slavery Party in Kansas. In November and December, 1855, during the so-called 'Wakarusa War' it was besieged for a short time by a force of pro-slavery men; and on May 21, 1856, it was occupied and partially destroyed by another pro-slavery force. On August 21, 1863, a body of Confederate raiders under Quantrell almost completely destroyed it, and killed 123 of its citizens. Population, in 1890, 9997; in 1900, 10,862. See KANSAS.

LAWRENCE. An important manufacturing city and one of the county-seats of Essex County, Mass., 26 miles northwest of Boston; on both sides of the Merrimac River, and on several branches of the Boston and Maine Railroad (Map: Massachusetts, E 2). It includes the villages of Arlington District, Carltonville, and Hallsville. The Merrimac at this point has a descent of 26 feet in half a mile, affording water-power estimated at 10,000 horse-power, controlled by a dam of solid granite, 900 feet long and 30 feet high, thrown across the rapids, and by canals on each side of the river, the first of which was opened in 1848. The Pacific, Atlantic, Washington, Arlington, Everett, and Pemberton are the principal mills producing textiles, among which are included shirtings, calicoes, shawls, worsted dress-goods, cassimeres, flannels, broadcloths, cambrics, duck, etc. Other manufactures are paper, paper-mill machinery, foundry products, carriages, doors, sash and blinds, engines, boilers, beltings, and Archibald wheels. The city has the Essex County Truant School, Children's Home, Cottage and Lawrence Hospitals, a public library of over 50,000 volumes, and a large common and other public parks. There are also several bridges across the river, libraries for operatives in the principal mills, numerous private charitable institutions, and a number of county buildings. The government is vested in a mayor, annually elected; a bicameral council, and subordinate administrative departments, as follows: fire department and board of health, appointed by the executive subject to the consent of the board of aldermen; water board, elected by the council; and pauper department, superintendent of streets, and school committee, chosen by popular election. The city spends annually, in maintenance and operation, over $800,000, the principal amounts being about $170,000 for schools, $65,000 for charitable institutions, $60,000 for the waterworks, $60,000 for the police department, $55,000 for the fire department, and $40,000 for the health department. Population, in 1850, 8282; in 1860, 17,639; in 1870, 28,921; in 1880, 39,151; in 1890, 44,654; in 1900, 62,559, including 28,600 persons of foreign birth, and 87 of negro descent. Lawrence was created by act of the Legislature, March 20, 1845, out of parts of Methuen and Andover, and was incorporated as a city May 10, 1853. On January 10, 1860, the Pemberton Mill, five stories high, suddenly fell, and soon afterwards caught fire. Of the 700 persons in the mill, 100 were killed, and many more seriously injured. Consult Wadsworth, *History of Lawrence, Mass.* (Lawrence, 1880).

LAWRENCE, ABBOTT (1792-1855). An American merchant, legislator, and diplomat. He was born in Groton, Mass.; was educated in a district school, and at the Groton Academy (now the Lawrence Academy); removed to Boston in 1808, and there served an apprenticeship in the warehouse of his elder brother, Amos, with whom in 1814 he founded the famous firm of A. & A. Lawrence. Lawrence also took an active interest in several railroad enterprises; was president of the Essex Company, which in 1845 founded Lawrence, Mass. (named in his honor), and toward the latter part of his life was largely engaged in the China trade. From 1834 to 1837, and again from 1839 to 1840, when ill health forced him to resign, he was a member of Congress; and in 1842 he was one of the commissioners of Massachusetts, who coöperated with the commissioners of Maine, and with Daniel Webster, then Secretary of State, in negotiating the Webster-Ashburton Treaty (q.v.) concerning the northeast boundary of the United States, with England's representative, Lord Ashburton. He was United States Minister to England in President Taylor's Administration, in which capacity he rendered important services to the country, and became widely popular with the English people, though in 1852, wishing to devote his attention wholly to his business interests, he was recalled at his own request. He made many donations to charitable institutions, and in 1847 contributed $50,000 for the establishment of a scientific school at Harvard, which was named in his honor, and to which by will he subsequently contributed another $50,000. He left a like sum for the erection of model lodging-houses for the poor, the surplus income from which was to be forever applied to charitable purposes. Consult Hill, *Memoir of Abbott Lawrence* (Boston, 1883).

LAWRENCE, AMOS (1786-1852). An American merchant and manufacturer, born at Groton, Mass., and educated at the Groton Academy founded there by his father. After working as a clerk for several years, he embarked (1807) in the dry-goods business on his own account in Boston. In 1814 he formed a partnership with his brother, Abbott Lawrence (q.v.), and the firm became the foremost wholesale mercantile establishment in the country. He is best known for his connection with the cotton manufacturing industry in New England, the cities of Lawrence and Lowell owing their preëminence in this branch of industry largely to his efforts. Ill health compelled him to retire from active participation in business in 1831, and the later years of his life were spent largely in furthering various philanthropic enterprises. He contributed largely to the building of the Bunker Hill Monument, and gave large sums to Williams College and to the academy at Groton, which in 1843 was renamed Lawrence Academy in his honor.

LAWRENCE, George Alfred (1827-76). An English novelist, born in Braxted, Essex. He was educated at Oxford, and studied for the bar, but afterwards gave all his time to literature. His most famous book, *Guy Livingston, or Thorough*, was published in 1857. His other works include: *Sword and Gown* (1859); *Barren Honour* (1862); *Maurice Dering, or the Quadrilateral* (1864); *Breaking a Butterfly: Blanche Ellerslie's Ending* (1869); *Silverland* (1873); and *Hagarene* (1874).

LAWRENCE, George Newbold (1806-95). An American ornithologist, born in New York City. He was in the drug business until 1862, when he left it to devote himself to ornithology, upon which he had already spent much study. His collection of 8000 specimens, bought by the American Museum of Natural History in New York City, includes not only a very full list of birds found in the United States, but more than 300 new species from Mexico, Central and South America, and the West Indies. He was a member of many scientific societies, and contributed much to ornithological literature, and was a collaborator with Spencer F. Baird and John Cassin in *The Birds of North America* (1860).

LAWRENCE, Sir George St. Patrick (1804-84). An English soldier, born in Trincomalee, Ceylon. He was the brother of the first Lord Lawrence and of Sir Henry Montgomery Lawrence. He entered the army in 1822, and was adjutant of his regiment, the Second Bengal Light Cavalry, from 1825 until 1834, and fought in the Afghan War. Afterwards he was political assistant and secretary to MacNaghten, the envoy to Afghanistan, and was in Kabul during the insurrection when MacNaghten was killed (1841). In 1848 he was appointed political agent at Peshawur, and was prisoner for a year during the second Sikh War. Later he was active as political agent in Mewar, Rajputana, until 1857. When the great Mutiny broke out, he was for a time in command of all the forces in Rajputana. He retired with the rank of lieutenant-general in 1867. His *Forty-three Years in India* was edited by Edwards, and appeared in 1874.

LAWRENCE, Sir Henry Montgomery (1806-57). An English brigadier-general and colonial administrator. He was the elder brother of Lord Lawrence (q.v.), and was likewise famous as an administrator. He was Chief Commissioner of Lucknow, and virtually Governor of Oudh when the Indian Mutiny broke out. While in command of the handful of heroic men who defended the women and children in the Residency of Lucknow, Sir Henry was wounded by the explosion of a shell, and died July 4, 1857. He was the founder of the Lawrence Asylum at Octamund, for the reception of the children of the European soldiers in India. Saint Paul's Cathedral contains a monument to his memory. For his life, consult: Edwardes and Merivale (London, 1873) and McLeod Innes (London, 1898).

LAWRENCE, James (1781-1813). An American naval officer. He was born in Burlington, N. J., entered the United States Navy as a midshipman in 1793, became a lieutenant in 1802, and in 1804-05 distinguished himself in the war with Tripoli, commanding a gunboat and serving as second in command in Decatur's expedition to burn the captured *Philadelphia* under the guns of the shore batteries. In 1808 he served as first lieutenant on the *Constitution*, and then commanded successively the *Argus*, the *Vixen*, and the *Wasp* until 1811, when he was promoted to be captain, and was placed in command of the *Hornet*. In 1812 he cruised with Captain Bainbridge's squadron along the South American coast, and on February 24, 1813, captured the slightly inferior British brig-of-war *Peacock*, after a spirited engagement of fifteen minutes, near the mouth of the Memerara River—the *Hornet* losing only one man killed and two wounded. For this success, he received a gold medal from Congress, and was placed in command of the *Chesapeake*, then lying in Boston Harbor. On June 1, 1813, several days after taking command, he attacked the British frigate *Shannon*, about thirty miles off Boston. After a bloody engagement of fifteen minutes, in which he was mortally wounded, the *Chesapeake* was captured, and Lawrence was taken with his ship to Halifax, where on the 5th he died. While being carried below during the engagement, he uttered the words "Don't give up the ship," which soon became a motto in the navy, and which have remained connected with his name.

LAWRENCE, John (1750-1810). An American lawyer and legislator, born in Cornwall, England. At the age of seventeen he emigrated to America, and settled in New York City, where he studied law, and where in 1772 he was admitted to the bar. His success in his profession was immediate. He threw himself into the Revolutionary movement with ardor, and received a commission in the first regiment of New York militia, organized by his father-in-law, Alexander McDougall. In October, 1777, he became an aide on the staff of Washington, and in 1780 as judge-advocate-general presided at the trial of Major André (q.v.). After the war he resumed the practice of law in New York, and in 1785 was elected to Congress, in which he strongly advocated the proposed Constitution. This led to his being superseded in 1788 by an Anti-Federalist. In 1789 he was elected to the New York State Senate, and in the same year was elected a member of the first Congress under the new Constitution. He was also a member of the Second Congress (1791-93), and in 1794 was appointed by President Washington United States Judge for the District of New York. In 1796 he resigned from the bench to take his seat in the United States Senate, to which he had been elected to succeed Rufus King. He remained in the Senate until 1800, and was president *pro tempore* of that body in 1798-99. He was a stanch supporter of Hamilton, and was particularly opposed to any compromise between the Federalists, of which party he remained up to his death one of the principal leaders, and the 'Burrites.'

LAWRENCE, John Laird-Mair, first Lord Lawrence (1811-79). An English officer and Governor-General of India. The sixth son of Lieutenant-Colonel Alexander Lawrence, he was born at Richmond, Yorkshire. In 1827 he won a presentation scholarship to Haileybury College, where he obtained the prize for Bengali, and passed third in the examination for the Bengal Presidency cadetship. His first years in the Indian civil service were spent in Delhi and the neighborhood. On the annexation of the Punjab Lawrence was appointed Commissioner, and afterwards Lieutenant-Governor of the Punjab. The restless Sikhs became so attached to his firm and beneficent rule that at the outbreak of the Indian Mutiny Lawrence was enabled to send troops to the relief of Delhi and elsewhere, and thus was instrumental in maintaining British dominion in India. On his return to England he received the thanks of Parliament, with the grant of a pension of £1000 a year. He was made a baronet in 1858 and a privy councilor in 1859. In 1861 Lawrence was nominated one of the knights of the 'Star of India.' At the close of 1863 he was appointed to succeed Lord Elgin as Viceroy of India, and was made a member of the India Council. His administration lasted until 1869, in which year he was raised to the House of Peers. At the first election of the London School Board in 1870, Lord Lawrence was elected chairman, a post he subsequently resigned. He died June 26, 1879, and was buried in Westminster Abbey. Consult biographies by Smith (London, 1883); Temple (London, 1889); Aitchison (London, 1892).

LAWRENCE, Saint, the Deacon. One of the most celebrated martyrs of the early Church, the subject of many ancient panegyrics, and of one of the most elaborate of the hymns of Prudentius. He was one of the deacons of Rome, in the Pontificate of Sixtus II. (257-258), and as such was especially charged with the care of the poor and the orphans and widows. In the persecution of Valerian, being summoned, according to the legend, before the prætor as a Christian, and being called on to deliver up the treasures of the Church, he mockingly produced the poor and sick of his charge, declaring that 'those were his treasures'; and on his persisting in his refusal to sacrifice, being condemned to be roasted on a gridiron, he continued throughout his tortures to mock his persecutors. Many of the details of his martyrdom are probably due to the imagination of the poetical narrator; but the martyrdom is unquestionably historical, and dates from the year 258. His feast is celebrated on August 10th. The ground plan of the Escorial (q.v.) is supposed to be that of a gridiron in reproduction of the instrument of the martyr's death. It was erected in his honor, because on his day, August 10, 1557, the forces of Philip II. of Spain won a great victory over the French at Saint-Quentin.

LAWRENCE, Sir Thomas (1769-1830). An English portrait painter. He was born at Bristol, May 4, 1769. His father, who had been educated for the law, was an actor and afterwards an inn-keeper. At the age of ten he portrayed the notables of Oxford in crayon, and when his father removed to Bath, his son's studio, although he was but twelve years old, was a favorite resort of beauty and fashion. In his seventeenth year he began to paint in oils, and in 1787 he went to London, exhibiting a number of paintings and portraits at the Academy, the schools of which he entered. His attractive manner and appearance won his way into high society, and in 1789 he had attained Court patronage, and in the following year his painting, "An Actress," attracted much attention. In 1791 George III. induced the Academy to elect him an associate, against its own rules, since he was only twenty-one—an honor never since repeated. In 1792 he succeeded Sir Joshua Reynolds as painter to the King, whose portrait he painted in the same year. He was in high favor with George IV., who knighted him in 1815.

In 1817 he was sent to Aix-la-Chapelle to portray the European sovereigns and nobles there assembled, including the Emperors of Austria and Russia, the King of Prussia, and Prince Metternich. At Rome he was received as a second Raphael and assigned apartments in the Quirinal, where he painted two of his best portraits, those of Pius VII. and Cardinal Gonsalvi. He was made a member of the Academies of Rome and Florence, and on the evening of his return to England, in 1820, he was elected president of the Royal Academy. In 1825 he was sent to Paris to portray the King and the Dauphin. He possessed one of the finest collections of drawings of the old masters ever in private hands; part of which is now in the Museum of Oxford. He died in London, January 7, 1830.

Sir Thomas was the most celebrated painter of his day, but in the reaction against former extravagant praises, scant justice is now done him. He had an unusually acute perception of the graces of society—the elegant airs of the men, and the gracious smiles of the ladies. His execution was facile, his composition and draughtsmanship were good, but his portraits lacked character, and his color, though brilliant, was often hard and glassy. His most perfect works are his drawings in crayon and pencil. His few historical pieces were of little value, but some of his portraits, like those of Mrs. Siddons, and "An Actress," probably Miss Farren, are very beautiful. Among the most notable are the series of the participants in the congress of Aix-la-Chapelle, noticed above, in Waterloo Gallery, Windsor Castle. The National Gallery possesses those of Angerstein, Benjamin West, Mrs. Siddons, Sir Samuel Romilly, Miss Caroline Fry, and "Child with a Kid," besides others on loan. In the South Kensington Museum are those of Princess Caroline and Sir C. E. Carrington; in the National Portrait Gallery, George IV., Princess Caroline, Lord Thurlow, Lord Eldon, William Windham, James Mackintosh, Wilberforce, Warren Hastings, Samuel Rogers, Thomas Campbell, and Elizabeth Carter.

Consult: D. E. Williams, *Life and Correspondence of Sir Thomas Lawrence* (London, 1831); Lewis, *Imitations of Sir Thomas Lawrence's Finest Drawings* (London, 1839).

LAWRENCE, Sir William (1783-1867). A distinguished English surgeon, born at Cirencester in Gloucestershire. He was apprenticed in London in 1800 to Mr. Abernethy, by whom he was appointed demonstrator of anatomy at Saint Bartholomew's Hospital in 1803. He was made surgeon to the hospital, and was chosen fellow of the Royal Society in 1813. In 1815 he became one of the professors of anatomy to the Royal College of Surgeons; and in 1828-29 succeeded his teacher, Abernethy, as lecturer on surgery at Saint Bartholomew's. Taking from this period onward an active share in questions of reform, Lawrence made innumerable enemies, though his reputation as a surgeon and the importance of his position as a medical practitioner, together with his fame as a valuable contributor to medical literature, continued to bring him into recognition and power. As sergeant-surgeon to the Queen of England, he succeeded Sir Benjamin Brodie, receiving at the same time a baronetcy. Lawrence died of paralysis at Whitehall. His writings are very numerous; the following are the most important: *A Description of the Arteries of the Human Body, Reduced into the Form of Tables*, translated from the Latin of Adolphus Murray, professor of anatomy at Upsala; *The Treatment of Hernias; An Introduction to Comparative Anatomy and Physiology, being the Introductory Lecture delivered at the Royal College of Surgeons in 1819* (1819); *A Treatise on the Venereal Diseases of the Eye* (1830); *A Treatise on the Diseases of the Eye* (1843); *A Treatise on Ruptures* (1810; 5th ed. 1838); *The Hunterian Oration Delivered at the Royal College of Surgeons, 1834* (1834); *Lectures on Comparative Anatomy, Physiology, Zoölogy, and the Natural History of Man* (1848).

LAWRENCE, William (1819-99). An American jurist and politician, born at Mount Pleasant, Ohio. He graduated at Franklin College in 1838, and at the Cincinnati Law School in 1840. He became prominent in local and State politics, was commissioner of bankruptcy for Logan County in 1842, and from 1845 to 1846 served as prosecuting attorney. From 1845 to 1847 he was editor and proprietor of the *Logan County Gazette*, and later edited the *Western Law Journal*. From 1846 to 1848 he served in the Lower House of the State Legislature, and was a State Senator in 1849, 1850, and 1854. He was a reporter for the Supreme Court of Ohio in 1851; served from 1857 to 1864 as Judge of the Court of Common Pleas and of the District Court; had some military experience at Cumberland and New Creek, in 1862, as Colonel of the Eighty-fourth Ohio Volunteers; was a member of Congress from 1865 to 1877; and in 1880 became first Comptroller of the United States Treasury—a position which he held until his resignation in 1885. Among his published works are: *The Treaty Question* (1871); *The Law of Religious Societies and Church Corporations* (1873); *The Organization of the Treasury Department of the United States* (1880); *The Law of Claims Against the Government* (1875); *Decisions of the First Comptroller in the Department of the Treasury of the United States* (1881-85).

LAWRENCE, William (1850—). An American Bishop of the Protestant Episcopal Church, grandson of Amos Lawrence and son of Amos A. Lawrence, who was one of the founders of the Episcopal Theological School. He was born at Brookline, Mass.; graduated at Harvard in 1871, and in 1875 at the Episcopal Theological School, Cambridge. In 1876 he became rector of Grace Church, Lawrence, Mass. He was elected professor of homiletics and pastoral theology in the Episcopal Theological School in 1884; became its dean in 1888; was university preacher at Harvard from 1888 to 1891; and in 1893 was elected, and in the following year was consecrated, Bishop of Massachusetts to succeed Phillips Brooks. He wrote *Life of Amos A. Lawrence* (1889) and *Visions and Service* (1896).

LAWRENCE, William Beach (1800-81). An American jurist and political leader, born in New York City and educated at Columbia College. He studied law and after two years' residence in Europe was admitted to the New York bar in 1823. In 1826-27 he was secretary of the American Legation in London under Gallatin, served until 1828 as chargé d'affaires, returned to America in 1832, and having entered into partnership with Hamilton Fish, soon attained distinction in the practice of law. He lectured for a time on political economy at Columbia College, and was one of the promoters of the Erie Railroad. He made Rhode Island his permanent home in 1850, became Lieutenant-Governor in 1851, acted as Governor in 1852, and was a member of the State Constitutional Convention of 1853. He lectured on international law in Columbian University, Washington, D. C., and became widely known for his interpretation of disputes arising out of the provisions of the Treaty of Washington of 1871. His writings are marked by a broad and liberal interpretation of international relations. Chief among them are: *The Bank of the United States* (1831); *Institutions of the United States* (1832); *Discourses on Political Economy* (1834); *Biographical Memoir of Albert Gallatin* (1843); *The Law of Charitable Uses* (1845); an annotated edition of Wheaton's *Elements of International Law* (1855); *Visitation and Search* (1858); *Commentaire sur les éléments du droit international* (4 vols., 1868-80); *The Treaty of Washington* (1871); *Belligerent and Sovereign Rights as Regards Neutrals During the War of Secession* (1873); *Etudes sur la juridiction consulaire et sur l'extradition* (1880).

LAW'RENCEBURG. A city and the county-seat of Dearborn County, Ind., 22 miles west of Cincinnati, O.; on the Ohio River, and on the Baltimore and Ohio Southwestern, the Cleveland, Cincinnati, Chicago and Saint Louis, and other railroads (Map: Indiana, E 3). It has manufactures of coffins, flour, buggies, barrels, whisky, tube-well supplies, and edge tools. Settled in 1817, Lawrenceburg was first incorporated in 1847. The present government is administered by a mayor, chosen every four years, and a unicameral council. Population, in 1890, 4284; in 1900, 4326.

LAWRENCEBURG. A city and the county-seat of Anderson County, Ky., 14 miles south of Frankfort; on the Southern Railway (Map: Kentucky, G 2). It has a considerable trade in whisky, and ships also tobacco and live stock. There are distilleries, a barrel-factory, flour-mill, carriage-shops, etc. Population, in 1890, 1382; in 1900, 1253.

LAWRENCE SCIENTIFIC SCHOOL. See Harvard University.

LAWRENCE UNIVERSITY. A Methodist Episcopal institution of higher learning at Appleton, Wis., chartered in 1846 and named the Lawrence Institute of Wisconsin, in honor of its principal donor, Hon. Amos A. Lawrence of Boston. It was opened for students in 1849, when its present name was assumed. In 1902 the faculty numbered 34, with a student enrollment of 600, comprising 275 students in the collegiate department, 125 in the commercial school, 50 in the preparatory department, and 150 special students. The university confers the degrees of B.A., B.S., and B.Ph., and the Master's degree in arts. It also gives instruction by correspondence without conferring a degree, and has organized a university extension department. It has a library of 19,000 volumes. Its productive endowment in 1902 was $350,000, its income $35,000, the value of its buildings $171,000, and the total property under its control was estimated at $555,000.

LAWRENCEVILLE SCHOOL. An endowed preparatory school for boys at Lawrenceville, N. J., incorporated in 1882. The present school, on the John C. Green Foundation, absorbed the property of an earlier school, founded in 1810. There are five forms. In the last two years electives are allowed. The buildings include twelve masters' houses, two houses for the senior class, a large recitation-hall with an auditorium and a library of 5200 volumes, a chapel, and a gymnasium. The campus occupies 250 acres. The school had in 1903 a teaching force of 32 and about 400 students.

LAW REPORTS. See Reports.

LAWS AND USAGES OF WAR. A code of law governing the conduct of civilized warfare. It has special reference to the treatment of prisoners, non-combatants, spies, traitors, private property, rights of capture, occupation and conquest, blockades, rights and obligations of neutrals, Red Cross, etc. Many of the clauses of the code have been approved and agreed to by international conventions, while others have become sanctioned by long usage and the demands of civilization. See War; International Law.

LAW SCHOOL. A school, or institution of learning, where students are taught the knowledge of the law. The term is used loosely to include any organization devoted to this end, whether an incorporated highly organized body such as many modern law schools, or a simple private school for such instruction. See Legal Education.

LAW'SON, Cecil Gordon (1851-82). An English painter, born at Wellington, Shropshire. He was a pupil of his father, William Lawson, a Scotch portrait painter, and had some instruction from his brother Wilfred, but was mainly self-taught. He had exhibited for eight years before his works were finally appreciated, but in 1878 the "Minister's Garden" won immediate recognition. W. M. Rossetti says that Lawson "has three precious qualities—strength, sweetness, and sentiment." Other works by him, nearly always of English subjects, are: "The Hop Gardens of England," and "In the Valley, a Pastoral." Consult: Gosse, *Cecil Lawson, a Memoir* (London, 1883).

LAWSON, John (?-1712). An American Colonial official and writer. Seeking adventure, he came to Carolina from England in September, 1700, and landed at Charleston. Thence he made the trip on horseback to the settlements on the Neuse, in the Northern Colony. On the way he kept a journal describing minutely the country, the settlers, the Indians, animals, and plants. Soon he was made surveyor-general of the Colony, and explored much territory before unknown. He published: *A New Voyage to Carolina, Containing the Exact Description and Natural History of that Country, together with the Present State Thereof; and a Journal of a Thousand Miles Travel'd thro' Several Nations of Indians, Giving a Particular Account of Their Customs, Manners, &c.* (London, 1709). His activity aroused the anger of the Indians, who saw the resulting encroachment on their territory. In 1711, in company with Baron de Graffenried (q.v.), the head of the settlement of German Palatines and Swiss on the lower Neuse, he made a trip up the river, and was captured by the Tuscarora Indians. After a time De Graffenried was set free, but Lawson, who had quarreled with a petty chief, was executed, according to common belief, by having his body stuck full of pine splinters, which were then set on fire.

LAWSON, Sir Wilfrid (1829—). An English baronet, legislator, and temperance advocate. He was the son of Sir Wilfrid Lawson, of Aspatria, Cumberland, and early came into prominence in connection with his labors in the cause of total abstinence. In 1859 he was elected member of Parliament for Carlisle, and in 1864 introduced into the House of Commons a "Bill for the legislative suppression of the liquor traffic." In consequence of this measure, which failed to pass, he lost his seat in Parliament in the following year. On his father's death, in 1867, he succeeded to the family title and estates, and in 1868, as a follower of Mr. Gladstone, was again returned to Parliament for Carlisle. He represented that city until 1885, in the meanwhile having the satisfaction of seeing his Local Option Bill pass by a majority of twenty-six votes in 1880, a success repeated in 1881 and 1883. After a defeat by ten votes in the preceding year, in 1886 Sir Wilfrid was elected by a large majority to represent the Cockermouth Division of Cumberland in Parliament as a Gladstonian Liberal. He was again returned in 1892 and in 1895, but in 1900 lost his seat by 109 votes. Sir Wilfrid was elected the president of the United Kingdom Temperance Alliance.

LAWSONIA. An African and Asiatic shrub, the flowers of which are used as a cosmetic. See Henna.

LAW TERMS. The usual law terms in England and Ireland are those periods of the year during which the law courts sit in banc or in full court to dispose of business. These are of ancient origin, and are now fixed by statute as follows: Hilary term begins January 11th, ends January 31st; Easter term begins April 15th, ends May 8th; Trinity term begins May 22d, ends June 12th; Michaelmas term begins November 2d, ends November 25th.

LAW'TON, Henry Ware (1843-99). An American soldier, born in Lucas County, Ohio. He served with the volunteers on the Union side in the Civil War, and rose to the rank of brevet colonel. After the war he was appointed second lieutenant in the Forty-first Infantry, was transferred to the Twenty-fourth Infantry in 1869, and to the Fourth Cavalry in 1871. His operations in the West against the Indians, especially against Geronimo, were eminently successful, and by gradual promotion he attained the rank of lieutenant-colonel and inspector-general in 1889. In the war with Spain he was commissioned brigadier-general, and was in command of the Second Division of the Fifth Corps in the operations against Santiago. His leadership in the action at El Caney on July 1, 1898, was characterized by skill and gallantry, and after the fall of Santiago, he was promoted to be major-general, and received command of the Department of Santiago. In December, 1898, he was assigned to the Philippines as second in command to General Otis, and was actively engaged through the year 1899 until he fell in battle at San Mateo, Luzon, on December 19th.

LAWTON, William Cranston (1853—). An American author and educator, born at New Bedford, Mass. A graduate of Harvard, he taught the classics in his native town, then studied abroad (1880-83), taught in Boston, and finally took a chair of the classics in Adelphi College, Brooklyn, N. Y. Among his works are: *Three Dramas of Euripides* (1889); *Art of Humanity in Homer* (1896); *New England Poets* (1898); *Successors of Homer* (1898); and a volume of poems, *Folia Dispersa* (1895).

LAWYER. A generic term applicable to all persons who have made a special study of the law and who are entitled to the privilege of advising and representing clients. It includes advocate (q.v.), attorney (q.v.), counselor (q.v.), barrister (q.v.), proctor (q.v.), solicitor (q.v.), and even the judicial officers who collectively make up the bench (q.v.) and bar (q.v.). In primitive communities the lawyer is also a priest. There is but one set of rules of human conduct, and these are at once religious tenets and civil codes. As the State develops, municipal law becomes separated from religion, the usual division of labor takes place, and lawyers who are only laymen form a class distinct and apart from those who are avowedly priests. In some stages of political development, and in some countries to-day, the canonist plays almost as large a part in legal affairs as the secular legist or civilian.

At Rome, the era of civil lawyers begins about three hundred years before Christ with Coruncanius, the first plebeian *pontifex maximus*. From his time *prudentes*, persons learned in the law of the State, were a recognized class, acting as professional counsel and public expositors of legal principles. In some respects their work and influence differed widely from those of the English lawyer. In the first place, they were called on by the magistrates for opinions in litigated cases. Oftentimes these magistrates, such as prætors and curule ædiles, had no legal learning, and hence were forced to seek advice from others. But it was also customary for those who had enjoyed a legal training and experience to call in the assistance of other *prudentes*. In this way it happened that the Roman lawyer exercised an influence over judicial decisions which has never belonged to the English bar. See Civil Law; Jurisconsult.

The first official recognition of lawyers as a professional class in England appears in the reign of Edward I., when the Statute of Westminster 1 declares the penalty for certain misconduct by 'serjeant-counters.' Its evolution had undoubtedly been slow, but the statute just referred to is evidence that 'serjeant-advocates' had gained a foothold in English courts prior to 1275. Apparently the King was the first to employ professional counsel, for their earliest title is serjeants or servants of the King. Having asserted this privilege for himself, he conceded it to others. For a time private litigants are forced to obtain a special license from the King as a condition of employing counsel to appear for them in court. Later the King licenses the counsel, and litigants are free to employ any of such favored students of the law. The bar now becomes an integral part of the judicial system, having rights, duties, and functions as distinct and almost as important as those of the bench. From this time on, the opinion of the legal profession "is among the most powerful of the forces that shape the law" of England. See Legal Education.

According to the census of 1900, the professional lawyers of the United States numbered 113,450, thus constituting one in every three hundred and fifty of our male population. Two-thirds of our Presidents have been lawyers. A like proportion has obtained among our United States Senators, while more than half of our Representatives in Congress, as well as of our State legislators, have been members of the legal profession. Consult: Maine, *Ancient Law* (New York, 1878); Muirhead, *Roman Law* (Edinburgh, 1886); Pollock and Maitland, *History of English Law* (Cambridge, 1895).

LAWYER. A local name in the middle parts of the United States for (1) the bowfin (q.v.), and (2) the gray snapper (Neomenis). The burbot is sometimes called 'lake lawyer.'

LAXATIVE (from Lat. *laxativus*, loosening, from *laxare*, to loosen, from *laxus*, loose). A medicine which simply unloads the bowels, and is not able to cause active purgation, even if given in large doses. Purgatives are stronger, purging actively, while not capable of acting as poisons, even when used in large amount. There are two qualities by virtue of which food is laxative. The principal one is bulk. All aliment which contains a large amount of innutritious material affords a large residuum. It therefore distends the intestines, and stimulates the onward propulsion of the intestinal contents. Articles of diet which are very largely assimilable and afford but little residuum are constipating. Flesh-eating carnivora are habitually constipated, while herbivora are the opposite. While 'cracked wheat' is a laxative, fine wheat flour, from which the wheat-husk, constituting bran, has been removed, favors costiveness. Unbolted flour, Indian meal, and oatmeal are laxative. Molasses, brown sugar, ripe fruits, especially those of the citrus family, as well as prunes, figs, tamarinds, etc., are among the substances exerting a decided laxativeness. Cassia fistula, manna, magnesia, and sulphur are the drugs usually included under the subdivision laxatives of the group cathartics. See Cathartic; Purgative.

LAXENBURG, lăx'en-bōōrG. A village of Lower Austria, nine miles south of Vienna. Population, in 1890, 1126. It is noted for its handsome Imperial park and gardens, in which are the old castle (founded in 1377), the new castle (begun in 1600), and the Franzensburg in a mediæval style of architecture, built on an islet in the lake, between 1799 and 1836, and containing fine art collections.

LAY, Benjamin (1677-1759). A British-American philanthropist, and one of the earliest opponents of slavery, born of Quaker parentage at Colchester, England. At the age of eighteen he became a sailor, but subsequently, after his marriage in 1710, lived for a time at Colchester. A few years later he settled as a merchant in the island of Barbados, where he soon became convinced of the great iniquity of slavery. His agitation against the system rendered him so unpopular that he left the island and removed to Philadelphia. Here he continued to oppose slavery, and lost no opportunity to give expression to his abhorrence of it. He wrote a number of tracts against it, one of which, *All Slave-Keepers, that Keep the Innocent in Bondage, Apostates*, was published by Benjamin Franklin. He lived to see a great change in the attitude of the Friends toward the question of slavery, and it was partly owing to his efforts that the society ultimately resolved to disown all members who persisted in holding slaves. Lay was also a reformer along other lines. In 1737 he proposed humane improvements in the cruel criminal code of the time, and he opposed also the use of tobacco, tea, and animal food. His appearance was very extraordinary, for he was, according to Benjamin Rush, not much over four feet in height, was hunchbacked, and wore odd clothes. He died at Abington, Pa., and was buried in the Friends' burial-ground. Memoirs of him were published by Vaux and Francis.

LAY, Henry Champlin (1823-85). An American Bishop of the Episcopal Church. He was born at Richmond, Va., graduated at the University of Virginia in 1842, and subsequently at the Theological Seminary at Alexandria. Ordained deacon in 1846, he was minister at the Church of the Nativity, Huntsville, Ala., from 1847 to 1858; was consecrated Missionary Bishop of the Southwest in 1859, and was transferred to the Diocese of Easton (Md.) in 1869. He wrote *Studies in the Church* (1872) and *The Church and the Nation* (1885).

LAY, John Louis (1832-99). An American inventor, born in Buffalo, N. Y. He secured an appointment as second assistant engineer in the navy in July, 1862, and in 1864 invented the torpedo with which Lieutenant Cushing (q.v.) destroyed the Confederate ram *Albemarle*. After the evacuation of Richmond by the Confederate forces, he was employed in clearing the James River of obstructions which impeded the advance of Admiral Porter's fleet. On the close of the war he resigned from the service and went to South America, where the Government of Peru engaged him to mine the harbor of Callao as a defense against an expected attack by the Spanish fleet. He returned to the United States in 1867, and soon after perfected the Lay dirigible submarine torpedo, which he sold to the United States Government.

LAYAMON, lä'yȧ-mon (c.1200). The author of the *Brut*, a metrical chronicle of Britain. All that is known of him is told in the opening lines of his poem. He was a priest dwelling at Ernley on the Severn (Arley Regis, in North Worcestershire). It came to his mind, he says, to relate the noble deeds of the English; and to this end he traveled about to procure noble books. The book he made most use of was the *Roman de Brut* (1155), by an Anglo-Norman poet named Wace. Wace's poem in turn was derived largely from Geoffrey of Monmouth's *History of the British Kings*, written in Latin prose (about 1139). But in his wanderings Layamon gathered other traditions which he turned to good account. His poem derives its name from Brut, or Brutus, a great-grandson of Æneas. After the fall of Troy many of the Trojans, it was believed, were taken to Greece, where their descendants were living as slaves. They are freed by Brut and conducted to Albion. From this point Layamon relates the history of Britain down to the death of Cadwalader, who, according to tradition, was the last of the Celtic kings. He mentions Cymbeline, and tells the story of Lear and his unkind daughters, and a large section of his poem is devoted to the deeds of Arthur. The *Brut* is of great philological interest. It exists in two manuscripts which are assigned respectively to about 1200 and 1250. The older and better manuscript contains 32,243 short lines. The verse is at times alliterative as in Old English or Anglo-Saxon; and again assonance or rhyme is employed in imitation of the French. There occur, however, not more than a hundred words of French origin; a fact to which attention has often been called to show that in Layamon's time the French and English tongues had hardly begun to intermingle. The two manuscripts were edited with translation by F. Madden for the Society of Antiquaries (3 vols., London, 1847). Consult also Ten Brink, *Early English Literature*, vol. i. trans. (New York, 1883). See Geoffrey of Monmouth.

LAY'ARD, Sir Austen Henry (1817-94). An English traveler, archæologist, and diplomatist. He was born in Paris of English parents and spent several years of his youth with his father at Florence, in Italy. He began the study of law, but before finishing set out on a course of Eastern travel, visited several districts of Asiatic Turkey, and acquired a love for Oriental studies, which he never lost. In 1842 he paid a second visit to Mosul, where the French Consul, P. Botta (q.v.), was conducting excavations on the site of the ancient Nineveh. Layard, several years before Botta, had recognized the importance of these ruins, and formed the determination to continue the examination of the site of the ancient city. In 1845 he was able to begin his excavations, being liberally assisted by Lord Stratford de Redcliffe, then British Ambassador at Constantinople. In 1848 he received a generous subvention to carry on the work under the auspices of the British Museum. His excavations were successful to a remarkable degree. He sent to the British Museum a mass of sculptures and inscriptions, and discovered among other remains the library of King Asshurbanipal. (See Assyria.) The results of his labors were embodied in his works, *Nineveh and Its Remains* (1848), and *Nineveh and Babylon* (1853). In 1852 Layard became member of Parliament for Aylesbury, and was for a short time Under-Secretary of State for Foreign Affairs under Lord John Russell. In 1855-56 he served as lord rector of Aberdeen University. In 1860 he was elected to Parliament from Southwark. From 1861 to 1866 he was again Under-Secretary of State for Foreign Affairs. He was appointed chief commissioner of works and privy councilor in 1868, and in 1869 went as British Ambassador to Spain. In 1877 he was sent as Ambassador to Constantinople, where he remained until 1880. He was honored with the Order of the Bath in 1878, and in 1890 became a foreign member of the Institute of France. He died in London, July 5, 1894. Besides the works mentioned above, Layard published: *Monu-*

ments of Nineveh (series i., 100 plates, 1849; series ii., 71 plates, 1853); *Inscriptions in the Cuneiform Character from the Assyrian Monuments* (98 plates, 1851); *Early Adventures in Persia, Susiana, and Babylonia* (2 vols., 1887; 2d ed., abridged, 1 vol., 1894); and several works on art. See ASSYRIA; NINEVEH. Consult the *Autobiography*, ed. by Bruce (2 vols., New York, 1902).

LAYBACH, lī'bäG. A city of Austria. See LAIBACH.

LAY'COCK, THOMAS (1812-76). An English physician. He was born in Wetherby, Yorkshire; was educated at University College, London; studied for the medical profession in Paris and in Göttingen. He became known as a specialist in brain and nervous disorders by a number of learned treatises and contributions to the leading medical societies and journals, and in 1855 succeeded Dr. Alison as professor of the practice of physic and clinical medicine in Edinburgh University. In 1861 he was elected a Fellow of the Royal Society of Edinburgh, and in 1869 was appointed physician in ordinary to the Queen in Scotland. Of his numerous writings, the more important are: *A Treatise on the Nervous Diseases of Women, Comprising an Inquiry into the Nature, Causes, and Treatment of Spinal and Hysterical Disorders* (1840); *Principles and Methods of Medical Observation and Research* (1856); *The Social and Political Relations of Drunkenness* (1856); *Mind and Brain, or the Correlations of Consciousness and Organization with Their Applications to Philosophy, Physiology, Mental Pathology, and the Practice of Medicine* (2 vols., 1859). In the last, his most important work, the fundamental principles of the unconscious action of the brain and the theory of evolutionary development of nerve-centres were first promulgated. He also translated and edited Unger's *Principles of Physiology* (1851) and Prochaska's *Dissertation on the Functions of the Nervous System* (1851).

LAY DAYS. In maritime law, the number of days granted in the charter-party to the charterer or freighter of a vessel to load or unload in. Within the lay days no charge is made, but after their expiration a sum, stated in the charter-party, is charged and called demurrage. Lay days begin upon the arrival of the vessel at the usual place for discharging cargo. Sundays are counted in reckoning lay days, unless there be provisions to the contrary in the charter-party. See DEMURRAGE; MARITIME LAW.

LAYERING, ARCUATION. An artificial method of plant reproduction closely resembling the stolon in nature. A layer is an unsevered branch or stem surrounded by a medium such as soil or moss in which it may strike root. Generally a wound is made to hasten the process of rooting, but with most plants this is not essential. Some plants require only a few days, others even two years. Layering is a favorite method of multiplying woody plants, such as quince and gooseberry, which do not give satisfactory results with cuttings.

LAYNEZ, lī'nâth, or **LAINEZ,** DIEGO (1512-65). Second general of the Order of Jesuits. He was born at Almazan, Castile, in 1512; educated at the University of Alcalá, visited Paris in 1533, and became an ardent follower of Loyola. He accompanied the latter to Rome, where Pope Paul III. appointed him a professor in the College of the Sapienza (1537). Loyola died in 1556, and Laynez was elected general of the Order of the Jesuits in 1558. Offered a cardinal's hat, he refused it, preferring to devote his life to the service of the new Order. He represented it in the Council of Trent, and there and elsewhere sustained by discussion and controversy his tenacious ideas in favor of the absolute infallibility of the Pope. He laid the foundation at Venice of a college of Jesuits, and placed special stress on the importance of education which should influence the minds of the young for the good of the Church. He died in Rome, January 19, 1565. He published little, and his manuscripts are almost illegible. His speeches at the Council of Trent and selections from other writings have been edited by Grisat (2 vols., Innsbruck, 1886). Consult his *Life* by Boero (Paris, 1895).

LAY OF THE LAST MINSTREL, THE. A narrative poem by Sir Walter Scott (1805). This long metrical romance is a tale of the wild life of the Scottish Border in the sixteenth century.

LAY READER. In the Anglican Communion, a layman who is licensed by the bishop to read morning and evening prayer (with the exception of the absolution), officiate at funerals, and read the sermons of approved divines. The first reformed ordinal prepared under Edward VI. contains an office for the admission of readers, and in the following year (1560) five of them were 'ordained' in London. It seems to have been the intention of the reformers to preserve the ancient minor order of readers (q.v.), but the office became extinct in the eighteenth century. The last diocese in which lay readers were licensed was that of Sodor and Man, under Bishop Wilson (died 1775). The office was revived by Convocation in 1866, and now nearly 2000 are commissioned in England and about the same number in the Episcopal Church in America, where a canon passed in 1871 regulates the exercise of their office. Consult Restarick, *Lay Readers* (New York, 1894).

LAYS OF ANCIENT ROME, THE. Classical ballads, by Thomas Babington Macaulay (1842). They are four in number, of which "Horatius" is best known.

LAZARILLO DE TORMES, lä'thâ-rē̆'lyô dâ tôr'mâs. The first Spanish novel of the class called picaroon or picaresque. It was long thought to be the work of Hurtado de Mendoza (q.v.), but recent investigation has made it practically certain that it cannot be attributed to him. The story seems to have had its origin at Burgos. There appeared, in 1553, what is generally thought to be the first edition of the *Lazarillo*, and the publication of this was quickly followed by the appearance of a long series of similar romances of roguery. The *Lazarillo* is the unblushingly told autobiography of a rogue who began his adventures as the guide (*lazarillo*) of a blind man, and then passed some time in the service, respectively, of a priest, an indigent noble, a begging friar, a seller of indulgences, and so on, ending as a town crier at Toledo. The language of the story is pure Castilian. It was translated into English by David Rowland in 1586 and by James Blakeston in 1670. Consult Butler Clark's reprint of the first edition of the Spanish text (London, 1897); Foulché-Delbosc's edition (Madrid, 1901); Stahr, "Mendoza's Lazarillo de Tormes," in the *Deutsches Jahrbücher für Politik und Literatur* (Berlin, 1862).

LAZ'ARISTS, or CONGREGATION OF THE MISSION. An Order of missionary priests in the Roman Catholic Church, founded by Saint Vincent de Paul. Being for a time in the country, he found great need for religious instruction to exist among the peasants, and gathered several priests around him to forward this work. As it grew, Adrien Le Bon, Prior of Saint Lazaire, offered his priory for their use; they took possession of the house in 1632, and got the name of Lazarists from it. The institution was officially approved by the founder's patron, François de Gondi, Archbishop of Paris, in 1626, and in 1632 by Pope Urban VIII. As their primary object was to instruct and edify the peasants, it was stipulated in the original deed of endowment that they should "neither preach nor administer any sacrament in towns which are the seat of bishops, archbishops, or courts of justice, except in cases of extreme necessity." Besides their special work, they sought to reform the clergy by means of conferences and the establishment of seminaries. Saint Vincent prudently gave his rule no final shape until after many years of experience, in 1658. In his own lifetime missionaries had been sent to Italy in 1638, Tunis in 1643, Algiers, Ireland, and the Hebrides in 1646, and Madagascar in 1648; and before his death in 1660 the congregation numbered 622 members. The first house in Spain was founded by a colony from Rôme in 1704; the Spanish Lazarists kept persistently at their work, in spite of difficulties with liberal and revolutionary governments, and now possess sixteen houses. The French congregation also suffered severely from the Revolution, but was restored in 1804, receiving 15,000 francs from the public exchequer and a hospital in Paris. Napoleon, however, abolished them once more in 1809 and confiscated their property, which was restored by Louis XVIII. in 1816; they subsequently possessed fifty-six houses in France. They were invited to Germany in 1781 by the Elector Palatine Charles Theodore, who intrusted to them some institutions which had been conducted by the Jesuits before their suppression. They began work in Prussia in 1850, and had already eight houses when they were driven out by the *Kulturkampf* of 1873. They maintained a mission in Madagascar from 1648 to 1825. In China they have had a long and notable career from 1697 to the present day, and several of them have filled the office of vicar apostolic. The first Lazarist to work in North America came there in 1815 under the leadership of Dubourg, the future Bishop of New Orleans; the Order in the United States is now divided into two provinces, with over a dozen houses. See VINCENT DE PAUL, SAINT; and consult the works mentioned there, and *Recueil des principales circulaires des supérieurs généraux de la Congrégation de la Mission* (3 vols., Paris, 1877); *Mémoires de la Congrégation de la Mission* (9 vols., ib., 1863); *Annales de la Congrégation de la Mission* (55 vols., ib., 1834-89).

LAZARUS (Gk. *Λάζαρος*, *Lazaros*, more correctly *Ἐλεάζαρος*, *Eleazaros*, from the Heb. *'El 'āzār*, God has helped). (1) The name (probably fictitious) given by Jesus to the poor beggar in the parable, Luke xvi. 19-31. The unsupported idea that he was a leper has given rise to the term 'lazar-house,' meaning leper hospital. (2) The brother of Martha and Mary (q.v.) and a beloved friend of Jesus. He is named only in John xi. and xii. The literal truth of the story of the resurrection of Lazarus there given has been seriously questioned in many quarters. A number of attempts have been made to explain it so as to preserve its lofty teaching and at the same time eliminate the miracle. Consult the lives of Christ by Strauss, Renan, Weiss, Edersheim, O. Holtzmann, and Rhees for various views. For the prominent place given to the resurrection of Lazarus in early Christian art, consult Smith and Cheetham, *Dictionary of Christian Antiquities*, vol. i., pp. 949-950 (London, 1875-80).

LAZ'ARUS, EMMA (1849-87). An American Jewish poetess and philanthropist, born in New York City, July 22, 1849, and privately educated. She was attracted in youth to poetry, and published a volume of poems and translations at the age of eighteen. *Admetus and Other Poems* followed in 1871, and showed ripening talent; but her first mature work is *Alide*, a prose romance, based on an episode in Goethe's life (1874). *The Spagnoletto*, a tragedy (1876), was much praised. *Poems and Ballads of Heine* followed in 1881, and her original poems, *Songs of a Semite*, in 1882. When the Jews, expelled in great numbers from Russia, began to appear in destitute multitudes in New York in the winter of 1882, Miss Lazarus interested herself actively in providing technical education to make them self-supporting. She wrote also *In Exile* (1882), *The Crowing of the Red Cock*, and *The Banner of the Jew* (1882). A collection of *Poems in Prose* (1887) was her last book. Several of her translations from mediæval Hebrew writers have found a place in the ritual of American synagogues. Her *Complete Poems* with a *Memoir* appeared in 1888, at Boston.

LAZARUS, lä'tsȧ-rōōs, MORITZ (1824-1903). A German philosopher and psychologist. He was born at Filehne in Posen, and studied in Berlin. In 1859 he became prominently connected with philosophical thought by founding with Steinthal the *Zeitschrift für Völkerpsychologie und Sprachwissenschaft*, and became a leader in the modern Herbartian School. In 1860 he was chosen professor at Bern; in 1868 he became teacher of philosophy at the Berlin Military Academy, and in 1873 was made professor at the University of Berlin. His more important works are: *Das Leben der Seele in Monographien* (3d ed. 1883 sqq.); *Zur Lehre von den Sinnestäuschungen* (1867); *Ueber den Ursprung der Sitten* (2d ed. 1867); *Ueber die Ideen in der Geschichte* (2d ed. 1872); *Ideale Fragen* (3d ed. 1885); *Erziehung und Geschichte* (1881); *Was heisst nationale* (1880); *Unser Standpunkt* (1881); *Ueber die Reize des Spiels* (1883); and *Ethik des Judentums* (2d ed. 1901).

LAZES, lă'zĕz. A branch of the Mingrelian section of the Georgian stock, dwelling in the Caucasus in the Batum-Trebizond region, chiefly in Turkish territory. By some they are considered to be the descendants of the ancient Colchians. The Lazian language, which is spoken in several dialects, was studied by Rosen, who published an essay, *Ueber die Sprache der Lazen* (Berlin, 1843).

LAZHETCHNIKOFF, lȧ-zhĕch′nė-kôf, Ivan Ivanovitch (1794-1869). A Russian novelist and dramatist. His first success was his sketch of military life published after his retirement from the army in 1819. His dramas did not meet with the success gained by his historical novels, among which the most important are: *Poslednü Novik* (1833); *Ledianyi Dom,* translated into German with the title *Eispalast* (1835); and *Basurman* (1838). His complete works were published at Saint Petersburg in 1858.

LAZULI FINCH (so called from its blue color), or Lazuli Bunting. A small finch (*Cyanospiza amœna*) of the Western United States, where it replaces the indigo-bird (q.v.) of the East, which it closely resembles in habits and song. It is frequently reared as a cage-bird. The male has the head and upper parts a deep turquoise blue, with two white bars upon the wings; the breast is yellowish tawny, the abdomen white. The female is grayish brown.

LAZ′ULITE (from *lazuli*). An aluminum phosphate with iron and magnesium hydroxides that crystallizes in the monoclinic system. It is of an azure-blue color, resembling lapis-lazuli, with which it has been frequently confounded. This mineral is found both massive and crystallized in Styria, Switzerland, Sweden, and Brazil; and in the United States in Gaston County, N. C., and in Lincoln County, Ga.

LAZZARONI, läd′zȧ-rō′nė (It., beggars). The name by which the lowest class of the population is designated in Naples. They became prominent during the Revolutionary and Napoleonic era, when, as supporters of the Bourbons, they attacked with great ruthlessness the wealthy middle class and liberal nobility.

LEA, Henry Charles (1825—). An American historian. He was born in Philadelphia, September 19, 1825. For many years he was in the publishing business, but retired in 1880. He was prominent in patriotic service during the Civil War, and has displayed an active and honorable interest in public affairs. He will be remembered, however, for his studies in mediæval ecclesiastical history. His published works include: *Superstition and Force* (1866); *An Historical Sketch of Sacerdotal Celibacy in the Christian Church* (1867); *A History of the Inquisition of the Middle Ages* (1888); *A History of Auricular Confession and Indulgences in the Latin Church* (1896); *The Moriscos of Spain* (1901).

LEA, Isaac (1792-1886). An American conchologist, born at Wilmington, Del. He was a business man, a partner of a large publishing house in Philadelphia, who devoted his leisure to the collection and study of objects of natural history. He was especially interested in freshwater and land mollusks, and, during fifty years, continued to make contributions to the transactions of the scientific societies of Philadelphia concerning these animals. His most important writings are: *Observations on the Genus Unio* (13 vols., 1827-73); *Synopsis of the Family of Naiads* (1852-70). G. W. Tryon, Jr., published a full account of Lea's conchological work in Philadelphia in 1861. His immense collection of Unionidæ and his collections of gems are deposited in the National Museum at Washington. Scudder gave a literary biography of Lea in the *Bulletin of the United States National Museum,* No. 23 (Washington).

LEA, Mathew Carey (1823-97). An American chemist, born in Philadelphia. He devoted himself chiefly to the chemistry of photography, to which he made a number of important contributions. His publications include numerous papers on the chemical action of light and an excellent *Manual of Photography* (2d ed. 1871).

LEACH, William Elford (1790-1836). An English naturalist, born at Plymouth. He studied medicine at Saint Bartholomew's Hospital, and in the medical department of Edinburgh University, from which he graduated in 1812. He became interested in zoölogy, however, and in 1813 accepted a position in the British Museum. In 1815 he published the beginning of a work on British crustaceans which he never finished. He was appointed assistant curator of the natural history department of the museum in 1821, but was obliged to relinquish active work in the very same year, owing to an affection of the brain induced by overwork. He spent most of his remaining years in Italy, and died of cholera, near Tortona. Among his most important works are: *The Zoölogical Miscellany* (3 vols., 1814-17); *Systematic Catalogue of the Specimens of the Indigenous Mammalia and Birds* (1816); and *A Synopsis of the Mollusca of Great Britain,* published posthumously in 1852.

LEA′COCK, Hamble James (1795-1856). An African missionary. He was born in Barbados, where his father was a slave-holder. He became a clergyman and gave the privileges of the Church to all slaves of his parish, at the same time freeing his own slaves. Difficulty with the bishop, insurrection of the slaves, depreciation in the value of property occurring, he removed to the United States, where he was settled in Kentucky, Tennessee, and New Jersey. In 1855 he sailed for Africa as a missionary of the West Indian Church Association, and founded a station at Rio Pongas, Sierra Leone. Consult his biography, by Caswall (London, 1857).

LEAD. A city in Lawrence County, S. D., just south of the county-seat, Deadwood; on railways connecting with the Burlington and Missouri River, and the Chicago and Northwestern lines (Map: South Dakota, B 5). It has a hospital and the Hearst Free Library. The city is in the noted Black Hills mining region, and there are extensive gold-mining and commercial interests. Population, in 1890, 2581; in 1900, 6210.

LEAD (AS. *lēad,* Dutch *lood,* MHG. *lōt,* Ger. *Lot;* connected with OIr. *luaïde,* lead). One of the well-known metallic chemical elements. It is mentioned in the Book of Numbers as part of the spoils taken from the Midianites, and also in the Book of Job. Pliny gave the name of *plumbum nigrum* to lead, while tin he called *plumbum candidum.* Among the alchemists lead was designated by the character which is supposed to represent the scythe of Saturn. It is found native in small quantities, usually with a little silver and antimony. Its compounds found in nature include the sulphide, the carbonate, the sulphate, the phosphate, a chloroarsenate, as well as numerous compounds with rare elements, such as chromium, selenium, tellurium, vanadium, etc.

Lead Ores. The principal ore of lead is galena (PbS), which contains 86.6 per cent. of metal. The sulphate (anglesite), the carbonate (cerusite), and the phosphate (pyromorphite). are occasionally found in sufficient quantities to warrant exploitation; while the arsenate, chromate, vanadate, molybdate, and oxide have little metallurgical importance. Galena always contains some silver and usually a little arsenic, antimony, copper, zinc, and gold. When the content of silver reaches several ounces a ton, the ore is known as argentiferous galena, and is treated for the separation of the metals. Galena is a widely disseminated mineral, although it rarely occurs in large deposits. Along the Atlantic border of the United States there are numerous localities where it is found in veins that cut through the Archæan and Paleozoic rocks, the gangue material being quartz or calcite. These deposits have not been worked, however, for many years, owing to the great abundance of rich ores in the Western States. One of the most productive mining regions is in Southeastern Missouri. The ore is disseminated in limestone through a thickness of about 200 feet, and it has been taken out in enormous quantities from the workings at Mine La Motte, Doe Run, and Bonne Terre. Galena associated with zinc blende is found in Illinois, Wisconsin, and Iowa in proximity to the Mississippi River, and also in southwestern Missouri in Jasper and Newton counties, and across the Kansas border in Cherokee County. The argentiferous lead ores of the Rocky Mountain States are the principal sources of supply at the present time. The ore bodies are found in carboniferous limestone, for the most part along the contact with sheets of porphyry; they yield hard and soft ores containing cerusite and silver chloride. In the deeper workings the oxidized ores give way to the unchanged sulphides. Lead-silver mines are operated at several localities in Utah. Large quantities of lead in crude form are imported into the United States from Mexico and British Columbia and refined by Western smelters.

Metallurgy. For metallurgical purposes the chief ore of lead is galena. Next come the carbonate and the sulphate, the former of which is rarely smelted by itself and the latter very exceptionally treated alone. The following description, therefore, refers entirely to the reduction of galena. There are three general processes for reducing galena ore which are known as the air reduction process, the roasting and carbon reduction process, and the precipitation or iron reduction process. All of these processes require a subsequent refining process for the production of commercial lead pig.

In the air reduction process the galena is first roasted to such a degree that a mixture of lead sulphide, oxide, and sulphate is produced containing the three compounds in definite proportions, and then the temperature is increased, causing a reaction between the elements named, which produces metallic lead and sulphur dioxide. The operation is performed in reverberatory furnaces or in hearths, the former being the more common method. When the process is conducted in a reverberatory furnace the reduction period follows immediately after the process of roasting; in hearths the roasting and reduction proceed simultaneously. In the reverberatory furnace process a charge of ore weighing from one to four tons is placed in the furnace and subjected to roasting at a constantly increasing temperature for from two to four hours. The temperature is kept down by keeping the furnace doors open, and the charge is constantly stirred. The furnace doors are then closed and the fire urged for a period varying from an hour in some forms of the process to seven hours in other forms. During this operation metallic lead is formed and runs into the furnace slumps, whence it is drawn at intervals into suitable ladles. The temperature is then lowered and another period of roasting takes place; this is followed by a second increase of temperature, during which more metallic lead is obtained. These alternate periods of roasting and reaction are continued until the ore has given up all its lead.

In the hearth process the operations are in outline as follows: On the hearth, which has been previously almost filled with lead, some coal is strewn, and when the fuel is well lighted and glowing, the residue from a previous operation is placed on it. As soon as the ore begins to separate out a quantity of ore mixed usually with a little lime is thrown on the glowing mass and covered with a small portion of fuel. After ten or fifteen minutes the under side of this mass is stirred together and is then broken up and withdrawn onto the workstone, the top portion of the mass now sinking down in the hearth. On the workstone the slag is separated from the incompletely decomposed ore, and the latter, mixed with a fresh quantity of ore and a little slacked lime, is put back into the hearth, the separated slag being collected and worked up on the slag-hearth. After five or ten minutes the slag on the hearth is again broken up, the lower and partially smelted part withdrawn from the hearth and treated as before. A constant repetition of this operation constitutes the hearth process. The separated lead trickles through the fuel into the hearth, which, when full, overflows into suitable ladles.

In the roasting and carbon reduction process the ore is first roasted in heaps or in roasting furnaces of various forms, with the addition of quartz to bring the lead in the ore into the form of oxide and silicate. The roasted ore is next smelted in blast-furnaces, alternate layers of fuel and ore being charged at the top and a blast of air being introduced at the bottom. The products of the blast-furnace are metallic lead, lead matte, slag, and sometimes speiss. The molten lead is ready for refining, but the matte and speiss must be subjected to further process to secure the metallic lead contained. In the case of matte this process consists first of roasting and second of smelting, exactly as in the case of the original ore. The roasting and carbon reduction process is the one most widely used for smelting lead from galena.

In the iron reduction process the galena is smelted in reverberatory furnaces or, more commonly, blast-furnaces, with the addition of iron ore or metallic iron to produce a matte. The matte is then roasted and smelted to obtain the metallic lead. This process is seldom used alone, but is practiced to a considerable extent in combination with other processes.

The preceding processes are all employed with galena ores. Lead carbonate is smelted in blast-furnaces with suitable fluxes—limestone and slag from previous operations—the metallic lead draining into suitable slumps at the bottom of the furnace. Lead sulphate is usually smelted in connection with other ores, generally galena, but it may be smelted alone by one of several methods.

The lead obtained by any of the processes described contains impurities such as copper, arsenic, antimony, zinc, iron, bismuth, tin, and sulphur, and their removal where they exceed a certain proportion is necessary to produce marketable lead. Refining processes resolve themselves into the separation of copper by liquation or by means of zinc, and the extraction of the other metals with the exception of bismuth and the precious metals by melting in an oxidizing atmosphere. In liquation the copper rises to the surface of the molten lead in the form of scum which is skimmed off, and in the zinc process it combines with the zinc to form zinc scum, which is similarly removed. Oxidation of the other metals is brought about by melting and heating the lead, when they pass off one after another as the proper temperatures are reached. The melting is usually done in pots, but hearths and reverberatory furnaces are also employed. Lead containing silver may be refined by electrolysis. After being refined the molten lead is cast in molds into pigs and is then ready for the market. For a concise description of the metallurgy of lead, consult Schnable, *Handbook of Metallurgy* (London, 1898).

Properties of Lead. Metallic lead (symbol, Pb; atomic weight, 206.9) is a bluish-gray lustrous metal that is exceedingly malleable and ductile, and has a specific gravity of about 11.4. It melts at 320° C. (608° F.). It is very soft, being easily cut by a knife and scratched by the nail, and readily receives impressions. It leaves a black streak on white paper, and is an inferior conductor of both heat and electricity. Metallic lead is extensively used for piping, both for gas and water. As lead is somewhat soluble in water, it is particularly desirable that caution should be taken to draw off water that has been standing in pipes before using, especially when required for drinking. Owing to the fact that lead resists the action of acids, it has been extensively used in the construction of lead chambers in the manufacture of various acids, especially sulphuric. It is also employed in the manufacture of shot. The alloys of lead with other metals have been sufficiently described under Alloy.

Compounds of Lead. The two most important among the compounds of lead with oxygen are litharge and minium. *Litharge* is obtained when molten lead is heated at a moderate temperature in the air with constant stirring. It is used in the arts in the manufacture of flint glass, as a glaze for earthenware, for the preparation of lead salts, as a paint, and for drying oils. *Minium*, which has been known since the time of Pliny, is a scarlet crystalline granular powder, usually prepared by carefully heating very finely divided pure litharge or white lead. It finds extensive use in the arts as a pigment, also in the manufacture of flint glass, as a cement for making steam-tight joints, and in the manufacture of secondary batteries. (See Minium.) Lead combines with carbon dioxide to form the carbonate, which is found native as cerusite (q.v.). *White lead*, or basic carbonate of lead, $Pb(OH)_2.2PbCO_3$, is a white heavy powder. It is extensively used in the arts as a pigment and as a body for other colors in the manufacture of paints. It is produced artificially by the decomposition of basic acetates of lead by means of carbon dioxide. (See Paints.) *Lead acetate*, or sugar of lead, $Pb(C_2H_3O_2)_2.3H_2O$, is made by adding lead oxide to acetic acid and gently heating the mixture. It is used in medicine, in the arts, as a clarifying agent in the refining of sugar, and to a certain extent in chemical analysis. *Lead sulphate*, which is found native as anglesite, may be obtained artificially by precipitating a lead salt with sulphuric acid, yielding a heavy white powder which is sometimes used as a substitute for white lead. The various lead chromates are colored yellow; they are used as pigments and in calico-printing.

Medicinal Uses of Lead Compounds. A number of lead compounds are employed in medicine as astringents and sedatives. Most of them are thus applied externally for weeping eczema and ulcerations. The acetate is given internally as a remedy for diarrhœa in typhoid fever, for gastric ulcer, for intestinal hemorrhage, etc. The astringent action for which principally lead compounds are used, both externally and internally, is very powerful. While they have no effect on the healthy unbroken skin, they speedily form a coating of coagulated albumin on sores and ulcers, and cause coagulation of albumin in the tissues and contraction of the small vessels. For their excellent sedative effects, lead salts are used in pruritus. Ordinary 'lead water' contains lead in the form of *sub-acetate*. *Lead carbonate* (basic) is a 10 per cent. constituent of the official 'ointment of lead carbonate.' *Lead iodide* is a 10 per cent. constituent of the ointment bearing its name. *Lead oleate* is contained in ordinary lead plaster and in the 'Diachylon ointment' which is made from it.

Lead-Poisoning. Acute poisoning, which is but seldom met with, is due to the irritant action of lead salts on the alimentary canal. The treatment consists in administering an emetic (say, 20 grains of zinc sulphate), washing out the stomach, and then giving a dose of Epsom salt. Much more common and important is the chronic form of lead-poisoning. Chronic lead-poisoning may be due to drinking-water that has passed through new lead pipes (in course of time, a deposit of insoluble salts forms on the inner walls of pipes, and thus the danger of lead being dissolved in the water is considerably diminished), or water that has been kept for some time in lead cisterns. The amount of lead that may thus be dissolved depends much on the quality of the water. Considerable amounts are dissolved if the lead is exposed alternately to the action of air and of water. Another source of chronic lead-poisoning is in the often uncleanly habits of painters, plumbers, and workingmen engaged in the manufacture of lead compounds. Absorbed for the most part by the kidneys, lead may cause pronounced symptoms of anæmia, gout, chronic inflammation of the kidneys, chronic inflammation of the peripheral nerves, muscular paralysis, and more rarely certain forms of epilepsy and insanity. A well-known symptom consists in the formation of a characteristic dark-blue line on the gums, due to the precipitation of black sulphide of lead, the sulphur coming from the food or from tartar on the teeth. Another common symptom is known as 'painter's colic.' The treatment of chronic lead-poisoning consists in the administration of opium, cathartics, sour lemonade, soluble sulphates (Glauber's salt or Epsom salt), and potassium iodide. Of course, care must be taken to remove the cause and thus prevent further poisoning.

Consult: Putnam, "Toxic Affections from Arsenic and Lead," in *Keating's Cyclopædia* (Philadelphia, 1890); Oliver, *Lead Poisoning in Its Acute and Chronic Forms* (Edinburgh and London, 1891).

LEAD, SOUNDING. A device for obtaining soundings. It almost invariably consists of a lead bar of prismatic shape, in length five or six times its diameter, having a cup-shaped recess in the larger (which is the lower) end, and a hole for the lead-line in the other. The recess in the bottom of a lead is for the *arming*, which usually consists of tallow; this strikes the bottom when the lead is cast, and some sand or mud or whatever the bottom is composed of adheres to the arming and may be examined. If the bottom is clean and rocky this may also be determined by the effect on the arming. Sounding leads are of different sizes; *hand leads* weigh from 5 to 14 pounds; *coasting leads* from 25 to 50 pounds, and *deep-sea* (pronounced *dipsy*) *leads* from 75 to 120 pounds. For soundings greater than 20 fathoms sounding machines are now largely used. See SOUND, SOUNDING.

LEAD-LINE. The lead-lines are made of white line, wetted and carefully stretched before marking and frequently examined and measured to see that they have not stretched or shrunk. The marking on hand lead-lines is as follows: At 1 fathom, a toggle or piece of leather; at 2 fathoms, two strips of leather; at 3 fathoms, three strips of leather; at 5 fathoms, a white rag; at 7 fathoms, a red rag; at 10 fathoms, a piece of leather with a hole in it; at 13, 15, and 17 fathoms, the same as at 3, 5, and 7; and at 20 fathoms, 2 knots. The other fathoms are not marked and are called *deeps*, the lead-line being said to be divided into *marks* and *deeps*. For hydrographic work hand lead-lines are marked at every fathom, the *deeps* being shown by a small rag at 8, 9, 16, 18, and 19 fathoms; at 4 fathoms a piece of leather with 4 tails, and at 11 and 12 the same as 1 and 2 (omitting the toggle). In addition, every foot up to 5 fathoms is shown by a very small piece of white rag worked into the lay of the rope and every half-fathom by a piece of twine. *Deep-sea lead-lines* are marked at 20 fathoms with a piece of twine having two knots; at 30, with three knots; at 40, with four knots, and so on; while at every intermediate 5 fathoms there is a small piece of twine with one knot.

LEAD, or **LEADE,** MRS. JANE (1623-1704). An English mystic. She was born Ward in the county of Norfolk. Her first call to mysticism was in 1639. In 1654 she married a relative, William Lead, who died in 1670, and thenceforth Mrs. Lead lived quietly in London. Influenced by the writings of Jacob Boehme (q.v.), which had appeared in English, she began, in 1670, to have visions. These she recorded in successive volumes. One of them, in 1693, fell into the hands of Fischer of Rotterdam, and was translated by him into Dutch. Other volumes and translations followed, and Mrs. Lead became a recognized leader among the mystics of England, Holland, and Germany. Her followers called themselves 'The Philadelphia Society,' and believed her to be a true prophet. About 1693 she made the acquaintance of Francis Lee, a young Oxford scholar (because of his Oriental learning called Rabbi Lee), who became her amanuensis and adopted son, and married her daughter. She died in an almshouse at Stepney, London, August 19, 1704. Her writings number 16 titles and were once popular, but now are scarce. A few have been lithographed in the *Manuscript Library* (Glasgow, 1884 sqq.), e.g. *The Heavenly Cloud Now Breaking: The Lord Christ's Ascension Ladder Sent Down* (1681), treating of death and resurrection; *The Revelation of Revelations* (1683), recounting her visions; and *The Wonders of God's Creation Manifested in the Variety of Eight Worlds, as They Were Made Known Experimentally Unto the Author* (1695).

LEADENHALL MARKET. A great London market for the sale of poultry, game, and hides. Its name is derived from the lead-roofed manor of Sir Hugh Neville which anciently occupied the site.

LEADENHALL STREET. A well-known London street, the continuation of Cornhill. On it formerly stood the East India House, removed in 1862.

LEADER. The name given to the performer in an orchestra who plays the principal first violin. He is also called *concert-master*. It is his duty to attend to a uniform bowing of the violins, as it would look awkward if some performers used the up stroke, while others used the down stroke. He is supposed to be able to take the conductor's place in case of emergency. In small orchestras the leader is generally also the conductor (q.v.) and uses his bow as a bâton in passages that offer rhythmic difficulties.

LEADING OF VOICES. A term applied to the progression of the individual parts or voices in a musical composition, whether vocal or instrumental. What constitutes good or bad writing depends chiefly upon the skill with which the various voices are led. The fundamental principle of securing a masterly leading of the voices is the progression by seconds or steps whether they be whole or half steps, diatonic or chromatic. Another important principle is the retention in the same part of the same note if it is common to two or more chords. The leading of the bass, however, is an exception to these rules, since the tendency of the bass part is to proceed from the fundamental tone of one chord to the fundamental of the next. Although progression by steps is generally desirable, it is not always practicable in modern music. This is especially true in the case of the (generally highest) part having the melody, which frequently proceeds in harmonic skips. The leading of the voices is far more free in modern music than it was formerly, and hence a distinction is made between *strict* and *free* style. The former avoids in the progression of voices all difficult intervals (augumented second, fourth), whereas the latter admits such intervals under certain circumstances. Again, there is greater freedom in the progression of voices in instrumental compositions than in vocal, because pure intonation of difficult intervals is more easily attained by means of an instrument than by the human voice. In the leading of voices it is also of great importance whether a voice or part is *real* or only *reënforcing*.

LEADING TONE OR NOTE. In music, the major seventh of the diatonic scale, or the semitone below the octave, to which it leads. The resolution of this note in a chord is always a semistep above. Hence it can never be doubled, as open octaves would result in the progression to the next chord. See Harmony.

LEAD-POISONING. See Lead.

LEADS, The (It. *I Piombi*). The prison cells under the leaden roof of the Doges' Palace at Venice. They were destroyed in 1797.

LEAD'VILLE. A city and the county-seat of Lake County, Colo., 78 miles in a direct line southwest of Denver; on the Colorado Midland, the Denver and Rio Grande, and other railroads (Map: Colorado, D 2). The surrounding scenery offers magnificent attractions; and the city itself, at an elevation of 10,200 feet, affords much of unusual and striking interest. There are large sampling, refining, and reduction works, and smelting furnaces; also a handsome theatre, the Tabor Opera House; hospitals; and a United States fish-hatchery. Leadville was incorporated as a town in 1877, and as a city in 1878. Population, in 1890, 10,384; in 1900, 12,455.

Settled in 1860, Leadville soon became prominent as the centre of an active gold-mining industry. The apparent exhaustion of the gold deposits during the following decades, however, gave a serious set-back to its progress, and it did not regain its importance until 1879, after large bodies of lead-silver ores had been opened in California Gulch, from half a mile to four miles distant. The population increased from about 300 in 1877 to at least 6000 in the following year and to 15,000 in 1879. Other rich silver deposits were soon found on Carbonate, Iron, and Fryer hills in the Mosquito range, and the mineral output for Leadville during the period 1879-92 reached the total of $170,000,000. Further prospecting has since been rewarded by the discovery of rich ores within the city itself, thus assuring a long life to its mining industry. For some time the region about Leadville held first place in the production of lead and silver, and it is now gaining a prominent position as a producer also of gold, zinc, copper, bismuth, and manganese ores.

LEAF (AS. *lēaf*, Goth. *laufs*, OHG. *loub*, Ger. *Laub*, leaf). A lateral usually green outgrowth from the stem of a plant, whose principal function is to elaborate food. The most conspicuous form is the foliage leaf; that is, one which contains green tissue and is prominently concerned in food manufacture. (See Photosynthesis.) Very simple expansions of green tissue, which are commonly called leaves, occur among the algæ, especially the more complex marine forms, and in the case of the leafy liverworts and the mosses. But the highly organized foliage leaf is found only in the fern-plants (pteridophytes) and seed-plants (spermatophytes), associated with the vascular system. Such a leaf may develop several distinct regions, the most conspicuous of which is the expanded portion or blade. In many cases where the blade arises directly from the axis, and no other region appears, the leaf is called sessile. Very frequently, however, the blade has a stalk of greater or less length, called the petiole. In many cases, also, the petiole bears at or near its junction with the axis a pair of appendages of various form, called stipules. The stipules may be conspicuous and leaf-like or merely minute bract-like bodies; they may be distinct from one another or united in various ways. In the smartweeds they unite and form a conspicuous sheath about the stem just above the insertion of each leaf. Still another leaf region which may appear conspicuously in grasses is the sheath, which more or less surrounds the stem. The angle formed by the petiole with the stem is called the axil.

Forms of Leaves. The form of the blade varies greatly, and has given rise to a long list of descriptive terms, which are of service only to the specialist in classification. These terms apply to the general outline of the leaf, as linear, lanceolate, ovate, cordate, etc.; or to the character of its margin, as entire, serrate, toothed, lobed, etc.; or to the character of its apex or base, as acute, obtuse, etc. The greatest modification in the form of the blade arises from its branching, in which case the general blade becomes divided up into smaller blades called leaflets. Such branching leaves are usually called compound, and the compounding may occur twice or thrice or even more times, resulting in a general blade made up of very numerous leaflets. The stalks of the leaflets are called petiolules, and their stipules are stipels. Closely associated with the contour and branching of leaves is the system of veining or venation (q.v.). Two general types of venation are recognized, called the parallel and the reticulate (or net-veined) types. In a parallel-veined leaf the prominent veins run approximately parallel from the base to the apex of the blade, resulting in a comparatively narrow and elongated outline and an entire margin, as in grass-blades. This type of venation is characteristic of the monocotyledons, although all of them do not possess it, nor is it absolutely restricted to them. A more significant phrase for

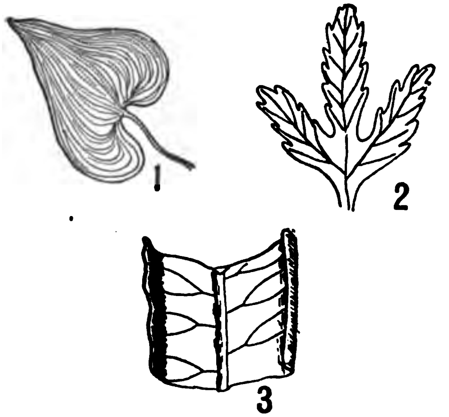


Fig. 1. types of venation.
1, parallel; 2, pinnate; 3, dichotomous.

this type, perhaps, is closed venation, implying that the veins do not end freely in the margin. As a result of this, such leaves do not become toothed or lobed, nor do they branch. In a reticulately veined leaf the veins branch freely in various directions, and there is usually evident, especially on the lower surface, a distinct and often conspicuous network of veins. Such leaves may be characterized as exhibiting open venation, as many of the veins have free ends, especially in the margins, resulting in a tendency to toothing, lobing, and branching. The dicotyledons exhibit such leaves in the greatest profusion. The ferns also have open venation, but the veins fork repeatedly, that is, they are dichotomous. (See DICHOTOMY.) Reticulately veined leaves exhibit two prominent types, the palmate and the pinnate. In the former, three or more main ribs diverge from the base of the blade, resulting in a broad outline. When such leaves are lobed or branched they are said to be palmately lobed or compound. In pinnate leaves there is a main rib (midrib) which runs through the blade from base to apex, and gives rise to lateral ribs of secondary importance, resulting in a comparatively narrow outline. When such leaves are lobed or branched they are said to be pinnately lobed or compound. Fern-leaves ('fronds') are very commonly pinnately compound, and a special terminology is applied to the branches, the main branches being called pinnæ, and the ultimate branches pinnules.

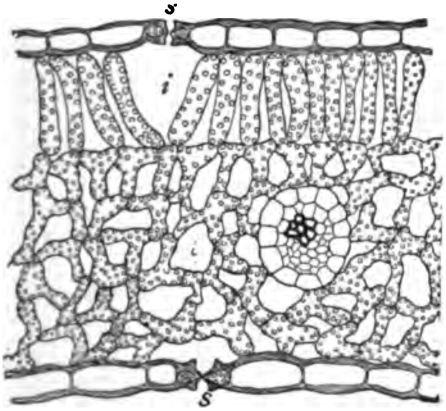


FIG. 2. CROSS-SECTION OF LEAF.

Showing upper and lower epidermis with stomata (*s*), air-chamber (*i*), in palisade parenchyma, and section of a vein in the spongy parenchyma.

STRUCTURE OF LEAVES. The minute anatomy or histology of the ordinary foliage leaf is quite uniform. The upper and under surfaces are bounded by a single layer of colorless compact cells, forming the epidermis (Fig. 2). Between these two layers of epidermis, above and below, the working cells of the leaf are found, called collectively mesophyll. The mesophyll cells contain the green color-bodies (chloroplasts), and in ordinary horizontal leaves are organized into two distinct regions. The cells against the upper epidermis are elongated and stand closely side by side, with the long axis at right angles to the leaf surface. This is called the palisade region of the mesophyll, and it is explained by the fact that this surface is exposed to the direct rays of light. The mesophyll cells in the lower region of the leaf are irregular in form and loosely aggregated, leaving irregular but continuous intercellular passageways. This region is called the spongy mesophyll. The third histological region of the foliage leaf is the vascular region, represented by the veins which traverse the mesophyll in every direction. The epidermis does not hermetically seal the mesophyll tissue from the outside air, but in leaves exposed to air it is perforated by numerous very small openings, called stomata (Fig. 3), popularly known as 'breathing-pores.' They are automatic gateways in the sense that the calibre of the pore may be enlarged or diminished in response to various conditions, thus regulating the amount of exchange between the air in the mesophyll region and that outside. The regulating mechanism consists in two concentric cells, called guard-cells, which face each other, and which may change the size of the opening between them, as the lips may regulate the opening of the mouth. Stomata occur in any epidermis which overlies green cells, and therefore they are naturally found in greatest numbers on the leaves. In the ordinary horizontal (dorsiventral) leaves they occur for the most part and sometimes exclusively on the under surface, averaging about 60,000 to the square inch, although in some cases the number may reach over 400,000. Leaves which are exposed to the light on both sides have the stomata equally distributed upon the two surfaces. In floating leaves the stomata are upon the upper surface only. The significance of the occurrence of stomata chiefly upon the under side of horizontal leaves is found in the fact that the intercellular passageways with which stomata communicate are best developed on the under side of the leaf. Associated with the epidermis of leaves there are also numerous hairs (see TRICHOMES), whose occurrence and character form part of the descriptions of systematic botany. For example, if hairs are absent, the leaf is spoken of as glabrous; and if present, the terms pubescent, hirsute, tomentose, woolly, etc., describe their character.

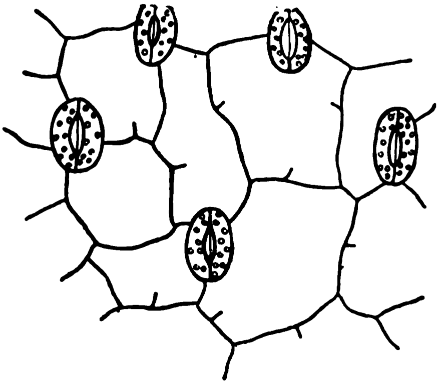


FIG. 3. EPIDERMAL CELLS AND STOMATA FROM A LEAF.

MODIFIED LEAVES. There are numerous structures in plants which have long been regarded as modified leaves—that is, leaves which have been diverted from their ordinary work as foliage leaves to serve some other purpose either exclusively or in addition to their ordinary work. It is a matter for serious doubt whether all such structures have actually been derived from foliage leaves, but they all may be grouped as foliar organs. In addition to foliage leaves, therefore, prominent among other foliar organs are the following: *Pitchers*, as in the various 'pitcher plants' for entrapping various insects; sensitive fly-traps, as in sundews and Dionæa (q.v.) (see CARNIVOROUS PLANTS); *storage organs*, as in bulb-scales, and many seed leaves (cotyledons); *bud-scales*, used for protecting young parts; *spines*, as in the barberry and holly, where every gradation between spiny-toothed leaves and true spines is found; *tendrils*, which are often leaves or leaf-parts adapted for climbing; *bracts*, which are leaves modified in size and color and associated with flowers; the *floral organs*, as sepals, petals, stamens, carpels, all of which may be regarded as foliar structures, but probably not modified foliage leaves as is commonly stated.

ARRANGEMENT OF LEAVES. The distribution of leaves on the stem has given rise to a subject called phyllotaxy, which undertakes to study the laws which govern the distribution. The general conclusion reached is that leaves are distributed so as to economize space and to obtain a light exposure, but this is to be regarded as the result of the arrangement rather than its cause. The most fundamental classification of leaves on the basis of arrangement is into the cyclic and spiral arrangements. In the former, two or more leaves stand together at the same joint (node) of the stem, dividing the circumference between them. If the cycle consists of two leaves they are called opposite, while if it consists of three or more they are called whorled or verticillate. In the spiral arrangements the leaves stand singly one after another—that is, each point of the stem bears but a single leaf, and they are commonly spoken of as alternate. It is the spiral arrangement which has developed the largest discussion in reference to the laws of phyllotaxy, for the cyclic arrangement represents merely two or more spirals ascending the stem. In the simplest alternate arrangement the second leaf stands upon the opposite side of the stem from the first, and the third leaf stands directly over the first. This results in two vertical rows of leaves, one on each side of the stem, an arrangement indicated by the fraction one-half. The whole fraction signifies the angular divergence between two successive leaves, the denominator the number of vertical rows. The next higher arrangement is one in which the angular divergence between two successive leaves is one-third of the circumference, and as a consequence the leaves occur in three vertical rows, and the fractional expression is one-third. The next higher arrangement is indicated by the fraction two-fifths, which means that the angular divergence is two-fifths of the circumference of the stem, that there are five vertical rows, and that the spiral line makes two turns around the stem before it reaches the same vertical row with which it started. The curious feature of the system appears at this point. Succeeding fractions may be obtained by adding the numerators and denominators of the two preceding fractions. For example, the fraction which follows the one-half and one-third arrangements is two-fifths, and the next would be three-eighths, and so on. The higher numbers, such as five-thirteenths, eight twenty-firsts, etc., occur in certain pine-cones, but in ordinary foliage leaves the lower numbers of the series are the common ones. It is often difficult to determine the normal arrangement, since the stem axis is not always perfectly straight in its growth.

ECOLOGY OF THE LEAF. Ecologically, the leaves of plants may be considered from the standpoint of the various leaf-forms found in nature, and (2) from that of the evidence obtained by experiments to determine the cause of the various forms. In general, leaves are expanded organs, and they also have a position which is in most cases perpendicular to the majority of incident rays of light. This position is technically termed diaheliotropic. It can readily be seen that these conditions favor the absorption of the largest quantities of radiant energy; and, inasmuch as radiant energy is essential to the growth and life of plants, it is clear that the expanded form and the diaheliotropic position are distinctly advantageous, though it by no means follows that the need for light has caused either the form or the position. Large numbers of leaves are finely divided; this is conspicuously true in the hydrophytes (q.v.), but it is also true of a vast number of plants with aërial leaves. While we can hardly believe that compound leaves have been caused in any such way, it is nevertheless true that a larger amount of leaf surface can be presented to the sunlight than in the case of plants with entire leaves. Perhaps the most

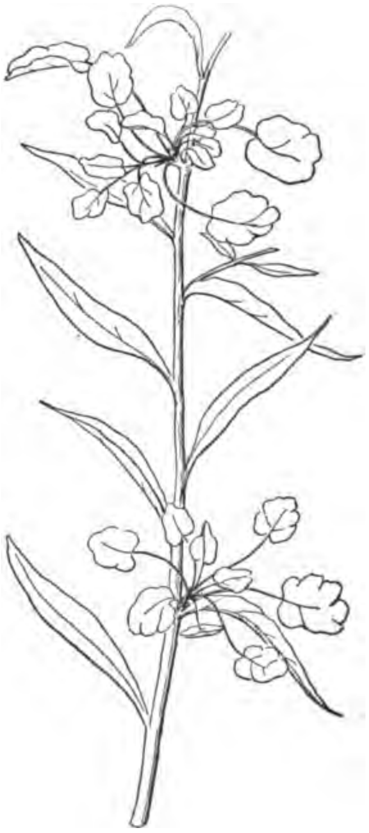


FIG. 4. BRANCH OF HAREBELL

(*Campanula rotundifolia*) which has suffered injury, and has in consequence developed basal (juvenile) leaves upon the stem. This result has also been ascribed to the illumination.

advantageous leaf type of all is that which is illustrated by the grasses; here vertical leaves or leaves which are approximately vertical are grouped together in vast numbers, probably securing the greatest leaf surface in a given space that is found anywhere in the plant kingdom. Simple experimentation shows, however, that the vertical position of grass-leaves, at least in many cases, is due to mechanical causes and has little or no relation to light stimuli. Another condition which favors the admission of light is the presence of petioles. Maple-leaves which are developed in the strong sunlight have short petioles, while more shaded leaves acquire long petioles and thus ultimately get into a well-lighted position, if that be possible. Petioles thus give a much greater plasticity and flexibility to leaves. Other leaves have the power of motility which is strikingly illustrated in the sensitive plant and clover. The advantage of this motility is not altogether clear, especially since the closing of the leaf occurs chiefly in the night rather than in the day. (For a further discussion of this topic, see XEROPHYTES.) The placing of the leaves on the stems also varies to a high degree in nature, and in general there seems to be a sort of relation between the phyllotactic arrangement and type of leaf arrangement, since the outer leaves are more commonly farther apart than small ones. Rosette plants present a very interesting type of leaf arrangement, since the outer leaves often have long petioles and the inner ones none at all; not only this, but the phyllotactic arrangement is such that the shading of one leaf by another is largely prevented. In one way or another, then, it seems that there is a general tendency in nature for plants to dispose their leaves in such a way as to prevent shading. It is very doubtful, however, if this can be regarded as a direct result of the light stimulus. If in nature leaves are not seen to shade each other to any great extent, it may not be that this is an adaptation by natural selection, but rather that the leaves which were shaded have been compelled to die through getting insufficient food; this results in a survival of the unshaded leaves. A study of the leaves of a patch of rank weeds shows that all the lower leaves have died and that only the uppermost have been able to endure.

Recent experimental studies on leaves by Goebel, Brenner, and others have contributed much to the solution of the question of the causes of leaf shape and form. Goebel's theory is that light is the chief factor in the matter. His experiments on cacti and on the harebell have shown that if the light is weak large leaves develop, whereas strong light develops small leaves. Other experiments which have been made more recently throw grave doubt upon Goebel's results; in the first place, many instances have been cited in which light favors rather than retards the development of leaves; and secondly, other factors which Goebel did not recognize have, even in the very forms which he studied produced the very results which he referred to light (Fig. 4). Kohl and more recently Brenner have considered that moisture is the chief element which affects leaf shape, particularly the relation which exists between absorption and transpiration. To illustrate, in a moist atmosphere leaves grow large because the transpiration is checked and the turgor is thereby increased. On the contrary, in a dry air leaves grow small because the transpiration is increased and the turgor reduced. In other words, anything which tends to increase or decrease cell turgescence tends to modify not only the leaf size but also the leaf form itself (Fig. 5). It is not possible at present, on account of the very small number of experiments, to reach any very definite conclusions. A great many differences which leaves show cannot now be referred to any mechanical cause, but it surely seems to be the present tendency to adopt an explanation of this kind for the variations in leaves rather than to give a teleological explanation.

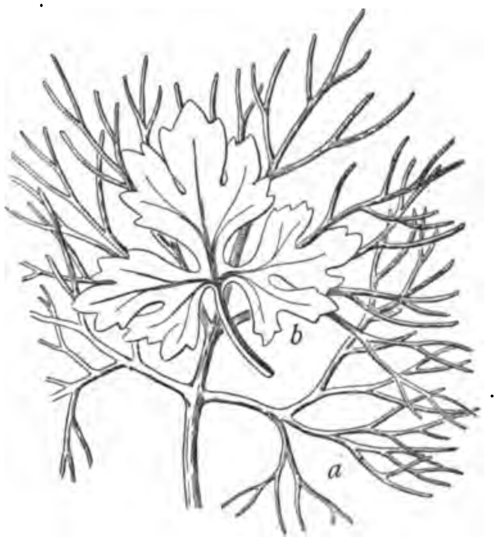


FIG. 5. LEAVES OF THE YELLOW WATER BUTTERCUP (*Ranunculus multifidus*): *a*, as grown in the water; *b*, as grown in the air.

The structure of leaves varies as well as the external form, and here also two prominent theories have been advanced to account for the changes observed. The chief changes which have been observed are associated with the chlorophyll cells and the epidermis. Stahl in particular has held that increased light causes the development of palisade cells. This view has been rather generally accepted and at present there seems to be no valid reason for serious objection to it. It may, however, rightly be a subject for further investigation to settle the question of the precise effect of light upon cell-structure. Leaves which are grown in a moist atmosphere develop a thin wall, whereas a thick wall is developed in a dry atmosphere. Perhaps the cause in the latter case is to be referred to the greater concentration produced by excessive transpiration. This might lead to a deposition of cell-wall material. Stomata, as a rule, are less subject to experimental change than are the other leaf-organs. However, some plants, as the mermaid weed, do not develop stomata when submerged. The stimulating cause for this change has not been suggested. For bibliography, see BOTANY. See also HISTOLOGY.

LEAF-BEETLE. Any one of a large family of beetles, the Chrysomelidæ, so called because both adults and larvæ feed on the leaves of plants. The family is an enormous one, as it comprises about 18,000 species. The great majority are found in the tropics, but 600 species occur in North America. The leaf-beetles are nearly all small, the potato-beetle being one of the largest of the family. The eggs, as a rule, are laid on the food plant. The larvæ of many species live on the leaves, either exposed or covered with grass. Some carry perfectly constructed cases; others are leaf-miners, as the Hispini; still others are root-borers and stem-borers, and a few are aquatic—a remarkable diversity of habit in the larvæ of a single family. The larvæ cover themselves with excrement. The most remarkable covering formed by any insect, perhaps, is that made by a tropical American leaf-beetle of the genus Porphyraspis, which lives on cocoa-palms at Bahia. The larvæ are covered by a sort of bird's-nest-like coating of fibres or threads attached to the anal extremity, which are wood fibres that have passed through the alimentary canal and have been stuck together again. Some of the tropical species of this group are extremely beautiful and mounted in gold are used as jewelry. With the species of temperate regions the color usually fades and becomes sordid after death. Among well-known destructive leaf-beetles are those of the genus Crioceris (see Asparagus Insects), the potato-beetle, and the cucumber-beetle, and its allies of the genus Diabrotica. In California the adults injure fruit and fruit-trees, and in the East they eat the leaves of cucumber, squash, and melon vines, and the young bore into the stems and roots of the same and other food plants. (See Corn-Insects.) All the Diabroticas are difficult insects to combat. Another group of agricultural pests in this family is that of the flea-beetles (q.v.). The brown and black larvæ of the grapevine flea-beetle feed on the upper surface of grape-leaves. A well-known and destructive species is the imported elm-leaf beetle. (See Elm-Insects.) On the sweet-potato and morning-glory vines small, flattened, beautifully iridescent leaf-beetles occur, which are gold and green. (See Golden Beetle.) Consult: Dimmock, *Standard Natural History*, vol. ii. (Boston, 1884); Sharp, *Cambridge Natural History*, vol. vi. (London, 1899).

LEAF-BUG. Any hemipterous insect of the family Capsidæ. The leaf-bugs form the largest family of the true bugs. They are usually rather small, slender and delicate insects. More than 1000 species have been described, of which 250 inhabit the United States, but there are many more undescribed and unnamed forms. They are found chiefly upon the leaves of plants, but are not all true plant-feeders, and very few of them occur in sufficient numbers to become important crop enemies. The four-lined leaf-bug (*Pœcilocapsus lineatus*) is, however, a common garden pest, all through the Eastern, Central, and Southern United States, sucking the sap of gooseberry bushes, currants, dahlias, and many other garden plants. Those species which are not plant-feeders are predaceous and destroy other insects.

LEAF-CUTTER BEE. A name given to certain species of solitary bees (see Bee) of the genus Megachile in consequence of their habit of lining their nests with portions of leaves, or of the petals of flowers, which they cut out for this purpose with the mandibles. *Megachile centuncularis*, a species common to Europe and the United States, uses the leaves (not the petals) of roses, fitting the pieces together so as to form one thimble-shaped cell within another, in a long cylindrical burrow, the bottom of each cell containing an egg and a little pollen paste. A single female will build 30 or more cells and will occupy 20 or more days in the work. *Megachile acuta* of the United States is a carpenter as well as a leaf-cutter, and excavates its tunnels in soft or partly decayed wood. In each tunnel thimble-shaped cells are made of pieces of rose-leaves and are filled with pollen and honey. One egg is laid in each cell, which is then sealed with circular pieces of rose-leaf. The cells of the leaf-cutter bees are also not infrequently placed in cracks of houses or trees, under stones and boards in deserted earthworm holes, or in the holes of carpenter bees (q.v.), in auger-holes, or in lead pipe; and they have even been found in the nozzle of an old disused pump. See Plate of Bees.

LEAF-FROG. One of the small American tropical frogs of the family Cystignathidæ and genus Hylodes, of which about 50 species are known. All are less than two inches long, are as a rule brightly colored and changeable, and have the general habits of tree-frogs (q.v.). The fingers as well as the toes are provided with disks, enabling the animals to cling to the leaves of plants and trees, as they habitually do. The males have vocal sacs and make chirping sounds. A remarkable species is the coqui (*Hylodes Martiniensis*), of Porto Rico, Haiti, and the Antilles, whose young undergo their whole metamorphosis before emerging from the protection of the egg. The female glues about 20 large eggs enveloped in a foamy mass upon a broad leaf, or in the axil of a flag, and then seems to remain near by awaiting developments. Each embryo (tadpole) grows to maturity within its egg, developing neither gills nor gill-openings, but apparently breathing through the highly vascularized tail. At last the food-yolk and liquids of the egg are exhausted, the tail is rapidly absorbed, and a minute but perfectly formed frog breaks the shell and hops away. A frog of the Solomon Islands has a similar method of development within the egg. See Hylodes.

LEAF-HOPPER. A bug of the family Jassidæ. The leaf-hoppers are among the most abundant of the bugs, and comprise a great complexity of forms. By most modern writers the group is considered of superfamily rank, and is known as Jassoidea. All are small insects. One species (*Cicadula exitiosa*) infests winter wheat. The grapevine leaf-hopper (*Erythroneura vitis*) often occurs in great numbers on the vine, and is very injurious to it. It is known to grape-growers as 'the thrips' or 'grapevine thrips,' a misleading name. (See Thrips.) Scores of species feed upon grasses and bring about a very extensive although probably unnoticed damage to the grazing ranges of the West.

LEAF-INSECT, or **Walking-Leaf.** One of a very remarkable group of insects of the orthopterous family Phasmidæ, natives of tropical countries, chiefly of the East Indian region, having wings extremely like leaves, not only in color, but in the way they are ribbed and veined. The joints of the legs are also extended in a leaf-like manner. So close is the resemblance that the natives of the countries where they abound firmly believe that they were once real leaves, which by some metamorphosis of habit have taken to walking. There is also a marvelous similarity between their eggs and plant-seeds, even in minute structure. These insects spend their lives among foliage, move slowly, and would be much exposed to every enemy, did not their leaf-like appearance preserve them from observation. Spectroscopic analysis of the coloring matter of these insects' wings shows a slight distinction from that of chlorophyll, but that it does not differ from that of living leaves. Confined leaf-insects will, in the absence of leaf food, eat one another's wings. See Mimicry.

LEAF-MANNA. See Lerp-Insect.

LEAF-MINER. A member of a group of very small moths, known as the Tineidæ, of serial or superfamily rank, containing a number of families and more than 4000 described species. The popular name 'leaf-miner' refers to the fact that the larvæ of very many species mine out the chlorophyll from between the upper and lower surfaces of the leaves of plants. The leaf-miners proper belong especially to the tineine families Gracillariidæ, Lavernidæ, Elachistidæ, Lithocolletidæ, Lyonetiidæ, and Nepticulidæ, but some of the Tineidæ and Gelechiidæ are also leaf-miners. Others of the tineine series are leaf-rollers, leaf-webbers, seed-feeders, twig-borers, gall-makers, and root-feeders, and others still feed upon animal matter such as skins, fur, woolen goods (see Clothes-Moth), and also upon dried fruits, stored grain, and similar substances. Some of them are leaf-miners only in early life, and later construct cases which they bear around with them while feeding externally on the foliage of plants. This habit is characteristic of the family Coleophoridæ.

Although very small, the tineines are frequently very beautiful and are ornamented with brilliant metallic scales. The wings are usually very narrow, sometimes lance-shaped, and bear long marginal fringes. Two species of Tinea have been recorded as viviparous. Examples of tineines are very difficult to collect and to preserve, and this accounts for the fact that, although 4000 species have been described, entomologists are really only just beginning the study of the group, which surely comprises very many thousands of species.

Certain other insects aside from these little moths are leaf-miners in the larval stage, as certain leaf-beetles of the tribe Hispini; certain flies of the families Oscinidæ and Anthomyiidæ; and certain saw-flies of the family Tenthredinidæ.

Consult: Sharp, *Cambridge Natural History*, vol. vi. (London, 1899); Comstock, *Manual for the Study of Insects* (Ithaca, 1895). See Butterflies and Moths; Saw-Fly.

LEAF-MONKEY. See Langur.

LEAF-ROLLER. A small nocturnal or crepuscular moth of the family Tortricidæ, most of which in the larval state roll themselves within the leaves of plants, fastening them with silken threads. They are generally less than an inch in breadth across the expanded wings, and have naked antennæ. The fore wings are usually marked with spots and bands, but the hind wings are without ornament. The larva either rolls a leaf into a nest in which it lives singly, or in some species many of them may bind all the leaves of a branch into one common nest. The yellow active larvæ of one species (*Cacœcia cerasivorana*) makes such a nest on the wild or choke cherry. The larvæ change to pupæ within the nest, but just before the moth emerges the pupa makes its way to the outer surface of the nest, where it hangs attached by caudal hooks. The rolling of the leaves with the solitary species is due in part to the individual work of the larva, in part to the contraction of the silk in drying, and in part to the changes in the growth of the vegetable tissue. Some tortricid larvæ are not leaf-rollers, but inhabit fruit, like the codling-moth (q.v.), the well-known enemy of apples and pears; *Carpocapsa splendana*, which lives in acorns and walnuts; and *Carpocapsa saltitans*, which inhabits the seeds known as 'jumping beans' (q.v.). Certain beetles (weevils) have a similar habit of rolling leaves.

LEAF-SPOT. A plant disease. See Diseases of Plants.

LEAGUE (from the Lat. *leuca*). A measure of length of great antiquity. It was used by the Romans, who derived it from the Gauls, and estimated it as equivalent to 1500 Roman paces, or 1.376 modern English miles. The league was introduced into England by the Normans, probably before the battle of Hastings (1066), and had been by this time lengthened to two English miles of that time, or 2.9 modern English miles. At the present day the league is a nautical measure, and signifies the twentieth part of a degree—i.e., three geographical miles, or 3.456 statute miles. The French and other nations use the same nautical league, but the former nation had (until the introduction of the metric system) two land-measures of the same name, the legal posting-league, 2.42 English miles, and the league of 25 to the degree, 2.76 statute English miles.

LEAGUE (OF., Fr. *ligue*, ML. *liga*, *lega*, bond, from Lat. *ligare*, to bind). In French history, a name specifically applied to the Holy League (Sainte Ligue) organized in 1576 by Henry, Duke of Guise (q.v.), in opposition to the granting of the free exercise of their religion and political rights to the Huguenots. While its ostensible object was the maintenance of the Roman Catholic religion in its predominance, the real aim of the Guises was rather to exclude the Protestant princes of the blood from the succession to the throne. For an account of the civil war that ensued, see France; Henry III.; Henry IV.; Huguenots. Consult also Mignet, *Histoire de la Ligue* (5 vols., Paris, 1829). See Holy League.

LEAGUE OF THE PRINCES (Ger. *Fürstenbund*). A league originated by Frederick the Great, in 1785, to oppose Joseph II. in his purpose of altering the constitution of the German Empire, and extending the Austrian power in South Germany by the acquisition of Bavaria in exchange for Belgium. The league was formed between Prussia, Saxony, and Hanover on July 23, 1785, and was afterwards joined by the dukes of Brunswick, Mecklenburg, Saxe-Weimar, and Saxe-Gotha, the margraves of Anspach and Baden, the Elector of Mainz, and other princes. Having effected the abandonment of Joseph's plans, the league was dissolved at Frederick's death, and a later attempt by Charles Augustus of Weimar to make it the basis of a German union under the leadership of Prussia was unsuccessful. Consult Ranke, *Die deutschen Mächte und der Fürstenbund* (2d ed., Leipzig, 1876).

LEAGUE OF THE PUBLIC WEAL (Fr. *Ligue du bien public*). An alliance of the great French nobles against Louis XI., formed in 1465 under the leadership of Charles, Count of Charolais (Charles the Bold of Burgundy). The ostensible object of the nobles was to put an end to the tyrannical government of Louis XI.; but in fact their objects were purely selfish, their only aim being to regain the old extensive feudal privileges, which had enabled them to defy even the royal power. They gained a victory over Louis XI. on July 16, 1465, at Montl'héry, and in October, in the Peace of Conflans, the King was forced to make great concessions. But the advantage gained by the nobles was of short duration, for the crafty monarch succeeded in crushing them individually, and made the royal power supreme in France. See FRANCE; LOUIS XI.

LEAKE, Sir JOHN (1656-1720). An English admiral. He was born at Rotherhithe, Surrey, England; early entered the navy, and distinguished himself under his father in 1673 in the action between Sir Edward Spragg and Van Tromp, and afterwards, when appointed captain, convoyed victualers into Londonderry, thus compelling the enemy to raise the siege. In 1702 he was promoted to the rank of commodore, and, in command of a squadron, destroyed the French settlements at Newfoundland, restoring the island to the English. For these services he was made on his return rear-admiral, and soon afterwards vice-admiral of the blue, and knighted. In 1704 he displayed great skill and gallantry in relieving Gibraltar when on the point of being taken by 500 Spaniards who had climbed up the rock. Soon after he was made vice-admiral of the white, and again, in 1705, relieved Gibraltar by destroying the French squadron. In 1706 he relieved Barcelona when reduced to great extremity by the Spaniards and French, obliging King Philip to raise the siege. In the same year he commanded the fleet which captured Alicante, Cartagena, and the island of Majorca. He was now made admiral of the white and commander-in-chief of the Mediterranean fleet. In 1708 he reduced Sardinia and Minorca. In 1709 he was made rear-admiral of Great Britain. The same year he was appointed Lord of the Admiralty, and continued high in office till the death of Queen Anne. He was several times a member of Parliament for Rochester. On the accession of George I. he was superseded on a pension of £600 a year. He died at Greenwich, on August 21, 1720. *The Life of Sir John Leake*, by Stephen Martin Leake, his nephew, was privately printed in London (1750).

LEAKE, WILLIAM MARTIN (1777-1860). A British officer and archæologist, born in London. He was educated at the Royal Military Academy at Woolwich, received a commission as second lieutenant in the artillery service, and in 1794 was ordered to the West Indies. Here he remained for four years, and in 1799 was sent as captain to instruct the Swiss in artillery practice. Leaving Constantinople in 1800 to join the Turks, who were then fighting the French in Egypt, he traveled through Asia Minor, Jaffa, and Egypt, and even traversed the desert, but arrived only after the capitulation had been signed. In 1801 he made a careful survey of Upper Egypt, and in 1804 traveled through the greater part of Turkey and Greece, surveying the coasts and fortresses and making collections, which are now in the British Museum. After undertaking extensive explorations in the Orient for the British Government (1808-13), he retired in 1823 with the grade of lieutenant-colonel. His principal works are: *Researches in Greece* (1814); *The Topography of Athens* (1821); *Journal of a Tour in Asia Minor, with Comparative Remarks on the Ancient and Modern Geography of that Country* (1824); *Travels in the Morea* (1830); *Travels in Northern Greece* (1835); and *Numismatica Hellenica* (1854). Consult Marsden, *Brief Memoir of the Life and Writings of W. M. Leake* (London, 1864).

LEAMINGTON, lĕm′ĭng-ton. A fashionable watering-place in Warwickshire, England, on the Leam, a tributary of the Avon, about two miles from Warwick (Map: England, E 4). Leamington is of modern growth and owes its importance to its mineral waters, saline, sulphurous, and chalybeate. It has a proprietary college, erected in 1847 in the Tudor style. In the centre of the town is a pump-room, a handsome structure. The manufacture of cooking-ranges is an important industry. The town owns the Spa baths, open-air baths, water-supply, gas, tramways, and cemeteries, and maintains free libraries, technical schools, and beautiful public gardens and parks. Population, in 1891, 26,900; in 1901, 26,850. Consult *Guide to and History of Leamington* (London and New York, 1888).

LEANDER, lē-ăn′dẽr. See HERO.

LEANDER, lā-ăn′dẽr, RICHARD. The pseudonym of the German surgeon and author Richard von Volkmann (q.v.).

LEAN′DER, SAINT (c.550-c.601). Archbishop of Seville. He was born at Cartagena, Spain, and became a monk. His zeal in converting the son and successor of King Leovigild was punished by banishment. He betook himself to Constantinople, and there formed a lasting friendship with Gregory, afterwards Pope Gregory the Great (590-604). About 584 Leander was made Archbishop of Seville, and in 599 Gregory sent him the pallium, and also dedicated to him his *Moralia in Jobum*. Leander's most important achievement was the conversion of the West Goths from Arianism to Catholic Christianity.

LEANING TOWER. A tower which overhangs its base on one side. The most celebrated example is the Campanile of Pisa, which has an obliquity of 13 feet in a height of 179. It was begun by the architect Bonannus of Pisa in 1174, continued by William of Innsbruck and others, and completed in 1350. It is built in the Romanesque style, to correspond with the cathedral, and is surrounded by open arcades of columns. Other well-known examples are in Bologna, the Torre Asonelli (1109), and the Torre Garisenda (1110), both built of brick, the latter well known through a passage in Dante's *Inferno.* The fallen Campanile of Venice also leaned slightly; there are other examples at Pisa, Ravenna, and elsewhere in Northern Italy, and a few in other parts of Europe. It is a disputed question as to whether the slant of these towers is accidental. That of Pisa shows an increased height in each successive story on the leaning side which has been attributed by some (Rohault de Fleury, Mothes) to attempts of the architects to rectify a sinking while the tower was being built. Others (Grassi, Ricci, Goodyear) have advanced arguments to show that the slant here and elsewhere was intentional. The latter is the prevailing opinion. Consult the article "Leaning Tower," in Sturgis, *Dictionary of Architecture* (New York, 1901-02). For illustration, see PISA.

LEAPING-FISH. See MUDSKIPPER.

LEAP INSECT. See LERP INSECT.

LEAP-YEAR. A year of 366 days (see CALENDAR), so called because it leaps forward a day as compared with an ordinary year. It so happens that the leap-years coincide with the years that are divisible by four without remainder, and thus they may be known. Of the years divisible by 100, only those are leap-years which are divisible by 400. The term *bissextile*, applied by the Romans to leap years, arose from their reckoning the sixth before the calends of March (February 24th) twice (*bis*), whereas we add a day to the end of the month, making February 29th.

LEAR, EDWARD (1812-88). An English artist and poet, born at Holloway, in London, May 12, 1812, into a large family of Danish stock. As a boy he showed a liking for painting and natural history; at the age of nineteen found employment as draughtsman in the Zoölogical Gardens; soon won the attention of the Earl of Derby, for whom he drew the plates to *The Knowsley Menagerie;* traveled extensively on the Continent and in the East, filling his books with drawings; settled in Italy; and died at San Remo, January, 1888. His work was rated very high by Ruskin and Tennyson. He captivated young and old with his humorous verse: *Book of Nonsense*, made for the children of the Earl (1846); *Nonsense Songs* (1871); *More Nonsense Songs* (1872); *Laughable Lyrics* (1877). Other works are: *Illustrations of the Family of the Psittacidæ* (1832); *Gleanings from the Menagerie at Knowsley Hall* (1846); and the journals of travel in Italy (1846), Greece and Albania (1851), the Ionian Islands (1863), and Corsica (1870). Consult Tennyson's *Poems*, illustrated by Lear, with memoir by Lushington (London, 1889).

LEAR, TOBIAS (1762-1816). An American diplomatist, born at Portsmouth, N. H. In 1783 he graduated at Harvard, and in 1785 was appointed private secretary to Washington, in which position he remained until Washington's death. From 1802 to 1804 he was consul-general at Santo Domingo, and in the latter year became consul-general at Algiers. He was appointed in 1805 to conclude a peace with Tripoli, and despite sharp censure from some quarters arranged terms approved throughout by the United States Government. Subsequently he was connected with the War Department at Washington as an accountant until his death by suicide.

LEASE. The act or instrument whereby any estate in land less than a fee is created. In its most extended sense the term thus includes the conveyance of a life estate, as well as the parol agreement which results in a tenancy at will or from year to year. More frequently, however, it is applied to the writing (not usually a deed) or the parol declaration creating an estate for years, or leasehold, as it is technically called. Formerly all leases, excepting leases for life (which required the same ceremonial as was requisite for the conveyance of a fee), were effected by parol. But the Statute of Frauds, passed in the twenty-ninth year of Charles II., made a writing essential to the validity of all leases for terms exceeding three years. This provision has in many of the United States been modified by statutes requiring leases for more than one year to be in writing.

The immediate effect of a lease for years is to vest in the lessee an interest in the land, known technically as an *interesse termini*, which has many of the characteristics of a leasehold estate, but which requires the entry of the lessee upon the land to make his title as tenant complete. Once in possession the lessee becomes the virtual owner of the premises for the period of his lease; he has a true estate in the land, which he can defend against the lessor as well as against the rest of the world, and which is limited only by the rules of law governing the relations of landlord and tenant.

As thus understood, a lease is a simple conveyance having no other effect than the creation of the bare property relation of landlord and tenant. The instrument by which the lease is effected may, however, include a variety of collateral agreements on the part of the lessor or the lessee, or both, creating contract relations between them in addition to the property relations. Of this nature are the usual stipulations of the lessee to pay a fixed rent, to keep the premises in repair, to make no assignment of the lease, or, on the part of the lessor, to grant a renewal of the lease, to pay for improvements at the expiration of the term, and the like. These agreements, if the instrument be under seal, become incorporated in the leasehold estate and, as the expression is, run with the land, binding successors of the lessor and lessee respectively as well as the original parties to the transaction.

It should be noticed, however, that a formal and valid lease is not necessary in all cases to create the relation of landlord and tenant. This may arise, as a tenancy at will or from year to year, by the entry of a tenant under a void lease, or, like a tenancy at sufferance, by the continued occupation without authority of a tenant whose lawful term has expired. Nor is it necessary that a lease shall specify all the obligations of the parties thereto. The most important of these, as the obligation of the landlord to defend his tenant's title, and the tenant's liability for waste and repairs, are the legal incidents of the relation of landlord and tenant, and exist without reference to the terms of the lease. See ESTATE; LEASEHOLD; LANDLORD AND TENANT, and consult the authorities referred to under the last of these, and under REAL PROPERTY.

LEASE AND RELEASE. An old form of conveyance of land. It had its origin in the practice of leasing land to a tenant for a term, as one year, and then, after his entry upon the land and during his term, releasing the reversion, or estate of the landlord, to him by a deed. The two transactions together had the effect of transferring the entire freehold estate of the grantor, which otherwise could be effected only by the notorious process of feoffment (q.v.), or livery of seisin (q.v.). It had the advantage over the latter of being a secret conveyance, but was subject to the disadvantage of requiring the actual entry of the tenant upon the land before he became capable of taking the reversion by the deed of release. This difficulty was obviated by the construction put by the courts upon the famous Statute of Uses (27 Hen. VIII., c. 10), which permitted the creation of a complete leasehold estate without the necessity of an entry by the tenant, by the device of conveying the land to his 'use' for a year. The statute in question, by executing the use, i.e. by transferring to the tenant a legal title coextensive with his use, or equitable title, vested the possession in him and thus rendered him instantly capable of taking the landlord's estate by release. The two instruments of lease and of release could thus be executed in quick succession, and, later, the two acts became simultaneous and were merged in one and the same instrument. This process of lease and release was the usual mode of conveyance in England for three hundred years, and prevailed in the United States as well, until superseded by the simpler conveyance by deed of grant, which is now in vogue in both countries. See DEED; GRANT; CONVEYANCE.

LEASEHOLD. In English law, the technical description of an estate for years. It arises upon a lease, and constitutes a valid title, or estate, in the premises for the period described. It may be for any period of time, however brief or long, whether for a week or for a thousand years, and is subject to no restriction excepting that the limit of its duration shall be definitely fixed. If a conveyance of land be indefinite it is not a leasehold, even though it be measured in years.

Owing to the circumstances of its origin, the leasehold estate is classified as personal property, which, upon the death of the tenant, or leaseholder, passes to his executor or administrator, and not, like real property, to his heir. Anciently such an interest was not regarded as property at all (the feudal conception of estates in land being confined to the class of interests known as freeholds), but as a mere contract right, enforceable only against the lessor or owner of the land, and against him only by an action for damages. But in the course of time, partly as the result of statutes and partly through a growing recognition of the importance of leasehold interests, the lessee came to be protected by a variety of actions, of which the action of ejectment was the most important, whereby he might recover the land itself either from his lessor or from any other intruder. The right of the lessee thus became a true estate in the land, strictly analogous to the freehold estates previously recognized, but it was now too late to secure its recognition as inheritable real property. As the right of action for breach of contract, which was all that the lessee formerly had, passed to his executor, so the leasehold estate which developed out of that contract right has continued to do to the present time. It is distinguished from other personal property by the phrase 'chattel real.'

This contract origin of the leasehold is responsible, also, for some of the advantages which it enjoys over the freehold. Not only may it be created and assigned with less difficulty and formality, as by parol or, at the most, by a simple writing, while a deed is requisite to the creation or transfer of a freehold; but it has always been capable of being created so as to take effect at a future time, which, in the case of freeholds, was not possible at the common law.

Technically, the proper mode of creating an estate for years is by a lease, or demise, followed by the entry of the lessee. Any form of words showing the intention to create the relation of landlord and tenant will suffice. See ESTATE; FREEHOLD; LANDLORD AND TENANT; LEASE.

LEAST SQUARES, METHOD OF. An application of the theory of probabilities (q.v.) to the deduction of the most probable value from a number of observations, each of which is liable to certain accidental errors. The methods by which this is done may be understood from a single example. Let it be found that a given bar has, at the temperatures of 20°, 40°, 50°, and 60° C., respectively, the lengths 1000.22, 1000.65, 1000.90, and 1001.05 millimeters; and let it be required to ascertain the coefficient of linear expansion, i.e., the amount of linear expansion per degree of temperature. If l_0 denotes the length of the bar at 0° C., c the coefficient of linear expansion, and l_t the length of the bar at t° C., then $l_0 + t\,c = l_t$. Substituting respectively 20 and 40 for t, and the corresponding values of l_t, we get $l_0 + 20c = 1000.22$ and $l_0 + 40c = 1000.65$. Solving these two equations for l_0 and c, we obtain: $l_0 = 999.79$, and $c = 0.215$. But if these values of l_0 and c are then substituted in the equations corresponding to $t = 50$ and $t = 60$, we find, respectively, $l_{50} = 1000.87$, $l_{60} = 1001.08$, instead of the experimental figures 1000.90 and 1001.05. The difference between the 1000.87 and the 1000.90, $-\,0.03$, is called the residual of the third equation, while $+\,0.03$ is obviously the residual of the fourth equation.

In the same way we might solve the first and fourth equations and obtain $l_0 = 999.80$, $c = 0.0208$, in which case the residuals of the second and third equations would be $+\,0.02$, $+\,0.06$. Other combinations of the given equations would give other residuals, and the smaller the residuals the closer the probable approximation. It can be shown analytically and experimentally that in a series of observations affected by accidental errors, errors whose law of recurrence is such that in the long run they are as often positive as negative, the number of errors of a given magnitude is a function of that magnitude. This particular function is $f(x) = h\pi^{-\frac{1}{2}}e^{-h^2x^2}$, where h is a constant for all observations of a series, and π and e have their usual meanings. The distribution of residuals follows this law, which is represented graphically by the curve $y = h\pi^{-\frac{1}{2}}e^{-h^2x^2}$. If $x = 0$, $y = h\pi^{-\frac{1}{2}}$, and therefore varies directly as h; but as x becomes very large, y becomes very small. That is, the number of errors of very small magnitude is relatively large, and the number of errors of very large magnitude is small. It has further been found that the sum of the squares of the residuals, Σx^2, varies inversely as h, and hence when h is largest, Σx^2 is smallest; in other words, that the most probable values of the unknowns are those which make Σx^2 a minimum. From this is derived the name *Method of Least Squares.*

For example, suppose a circumference, x, bisected by a diameter, is measured and found to be c, and the two semicircumferences are also measured and found to be s_1, s_2, and we are required to find the most probable value of x. The residuals are $c - x$, $s_1 - \frac{1}{2}x$, $s_2 - \frac{1}{2}x$.

Hence, assuming only accidental errors, $f(x) = (c - x)^2 + (s_1 - \frac{1}{2}x)^2 + (s_2 - \frac{1}{2}x)^2 =$ a minimum, or $f^1(x) = 2\ (x - c) + \frac{1}{2}x - s_1 + \frac{1}{2}x - s_2 = 0$, whence $x = \frac{1}{3}\ (2c + s_1 + s_2)$, the most probable value.

The method of least squares is due to Legendre (1805), who introduced it in his *Nouvelles méthodes pour la détermination des orbites des comètes.* In ignorance of Legendre's contribution, however, an Irish-American writer, Adrain, editor of *The Analyst* (1808), first deduced the law. He gave two proofs, the second being essentially the same as Herschel's (1850). Gauss gave the first proof which seems to have been known in Europe (the third after Adrain's) in 1809. To him is due much of the honor of placing the subject before the mathematical world, both as to the theory and its applications.

For an introduction to the method of least squares, consult Comstock, *Method of Least Squares* (Boston, 1890); and for the history of the method, consult Merriman in the *Transactions of the Connecticut Academy* (1877, vol. iv., p. 151, with a complete bibliography).

LEATHER (AS. *leþer,* OHG. *leder,* Ger. *Leder,* leather). The skin of an animal, dressed for use by some process which shall render its texture permanent in character. Untreated fresh skin is easily putrescible; dry skin is hard and horny and almost impenetrable to air. By converting a skin into leather, however, its nature is entirely changed and it is rendered practically imperishable, porous, and flexible. The skin of an animal consists of two layers: the outer or epidermis, which has no blood-vessels and is hard and horny, and the inner true skin or corium, which is made up of gelatinous fibres. This inner layer or true skin is the basis of leather, and the process of leather-making consists of applying to this skin certain substances which shall enter into combination with the gelatin in such a manner as to produce the desired characteristics of durability, penetrability, and flexibility. Three methods of accomplishing this have been practiced from very early times: *Tanning,* in which the gelatin is combined with tannin or tannic acid, or, by a much later process, with chromium salts. *Tawing,* in which the gelatin is combined with certain mineral salts. *Shamoying,* in which the leather is combined with oil or fatty substances.

Historical Development. Probably the original process of curing skins was that of simply cleaning and drying. Then, the use of smoke, sour milk, various oils, and the brains of the animals themselves was found to improve the texture of the leather. Later it was discovered that certain astringent barks and vegetables effected permanent changes in the texture of skins, and stopped decay. This knowledge was possessed by the ancient Egyptians, for engravings on their tombs depict the process of tanning. In China specimens of leather have been discovered in company with other relics that prove them to be over 3000 years old. The Romans used leather which they tanned with oil, alum, and bark. The earliest explorers of America found the Indians wearing skins prepared with buffalo-dung, oil, and clay. No improvement in the general methods of preparing leather took place from the most primitive times until about 1790, when the use of lime, to loosen the hair, was introduced. By 1825 English tanners were attempting to introduce new methods by which the tanning process could be shortened. One of the pioneers in these experiments was John Burridge, the inventor of the 'barkometer,' an instrument for determining the strength of tanning-liquors.

Tanning Industry in the United States. The first tannery in America was built in Virginia, in 1630. A few years later a second one was established in Lynn, Mass. The tanning industry was well represented among the early settlers of Massachusetts, for it is recorded that no fewer than 51 tanners had come over to the new colony before 1650. There was great demand for their labors, for skins accumulated so rapidly that in 1640 it was found necessary to pass a law "that every hide and skin should be dried before it corrupts, and sent where they may be tanned and dressed." The tanning industry was also encouraged throughout the colonies by many laws forbidding the exportation of untanned leather. Tanneries flourished everywhere, and by 1810 their annual output was $20,000,000. See paragraph *Statistics.*

Manufacturing Processes. The hides of commerce are brought to the tanneries in four different forms: either they are simply 'green' or 'fresh' hides, direct from the slaughter-houses, or, in case they have been shipped from a long distance, they are wet-salted, dry-salted, or simply dried. The preliminary process of preparing the hides for tanning differs somewhat with the condition in which they are received, salted and dried hides requiring much more thorough cleansing and softening than green hides. The process also differs somewhat in preparing sole-leather, harness-leather, and dressed leather. The first step is to soak the skins or hides in water, to soften them, after which every vestige of adherent flesh is scraped from the inside. They are then laid in heaps for a short time, and afterwards hung in a heated room, by which means a slight putrefactive decomposition is started and the hair becomes so loose as to be easily detached. This process of unhairing, called 'sweating,' is mostly followed in America for making sole-leathers, while the process of *liming* or loosening the roots by the milk of lime is used for dressed leather; but in Great Britain milk of lime is used for depilation of all leathers. The process may be hastened by use of sulphuric or other acid. Hides or skins intended for dressing purposes, as for shoes, coaches, harness, or bookbinding, after the hair is taken off by the lime, have to be submitted to a process called *bating* for the purpose of reducing the swelling or thickening occasioned by the introduction of the lime, and for cleansing the skin from grease and other impurities. This is effected by working the skin in a decoction of pigeon's or dog's dung and warm water. This process does something more than cleanse the leather; it effects a marked change in its texture, reducing it to an extremely flaccid condition. If the old method of tanning is followed, the hides after unhairing are placed in the tan-pits, with layers of oak-bark or other tanning materials between them, and when as many layers of hides and bark are arranged as the pit will hold, water is let in, and the hides are allowed to remain for an indefinite period to be acted on by the tanning material. Various means for shortening this process have been devised, such as forcing the tanning-liquor through the skin by pressure, sewing the skins together into a bag in which the liquor is suspended, and simply substituting for the dry bark which was formerly used liquid infusions of tanning materials, which are gradually increased in concentration as the process advances. The last-named method, though the slowest, is found to produce the best leather, and the process of tanning is still a tedious one, consuming weeks or even months. The general method employed in American tanneries is described by Sadtler as follows:

"The tan-house into which the cleansed and prepared hides or 'butts' now come is provided with rows of pits running in parallel lines, which are to contain the butts during their treatment with tan-liquor. The butts in most cases are first suspended in weak tanning infusions before they go into the first, or 'handler' pits. The object of this is to insure the uniform absorption of tannin by the skins, before subjecting them to the rough usage of 'handling,' which in the early stages of the process is liable to cause injury to the delicate structure of the skin. During this suspension the skins should be in continuous agitation to cause the tannin to be taken up evenly. Both the suspension and the agitation are accomplished generally by mechanical means. From the suspenders the butts are transferred to the 'handlers,' where they are laid flat in the liquor. They are here treated with weak infusion of bark, commencing at about 15° to 20° by the barkometer and are handled twice a day during the first two or three days. This may be done by taking them out, turning them over, and returning them to the same pit, or more generally by running them, fastened together, from one handler pit to another. The treatment of the butts in the handlers generally occupies about six to eight weeks, by which time the coloring matter of the bark and the tannin should have 'struck' through about one-third of the substance of the skin. Many of the butts will have become covered, moreover, with a peculiar 'bloom' (ellagic acid) insoluble in water. They are now removed to the 'layers,' in which they receive the treatment of bark and 'ooze' or tan-liquor in progressive stages until the tanning is complete. Here the butts are stratified with ground oak-bark or valonia, which is spread between each butt to the depth of about one inch, and a thicker layer finally on top. The pit is then filled up with ooze, which varies in strength from about 35° barkometer at the beginning to 70° at the end of the treatment. For heavy tannages six to eight layers are required, the duration of each ranging from ten days in the beginning to a month in the later stages. Each time the butts are raised they should be mopped on the grain to remove dirt and loose bloom."

Many materials besides oak-bark are now used to make tanning infusion, and some of these, being stronger, have hastened the tanning process. Among the most important of these are valonia, the acorn of an evergreen oak found in Asia Minor and Greece, which contains three times as much tannin as the strongest oak-bark; the sumach; the divi-divi and algarovilla, pods of South American trees closely allied to logwood; and the larch, spruce, pine, and hemlock barks. Besides this group there are the tanning materials derived from abnormal growths, caused by the sting of insects or other injuries, as galls (q.v.) and knoppern. The so-called 'union' tannage is produced by a combination of oak and hemlock barks.

Undressed leather, after it is tanned, needs simply to be rendered smooth and compact, which is accomplished by scouring and compressing the surface with stones, brushes, the 'striking-pin' and rollers, all of which processes are effected by machinery. Dressed leathers must, in addition, be 'stuffed' with oils to increase their resistance to water and their flexibility; they must frequently be dyed or stained in black or colors and 'grained.' These processes are also performed by machinery. In 1860 a machine was invented for splitting leather to any desired degree of thinness. The practice previously was to shave the leather down, the shavings being wasted. The process of dressing tanned leather known as currying was formerly a separate industry, but is now carried on as a part of the general business of leather manufacture. A favorite oil used by curriers for stuffing leather is the degras, or superfluous oil pressed from shamoyed leather. The demand for this oil is so great that its manufacture has recently become a separate industry.

Chrome-Tanning. The possibility of tanning by the use of chromium compounds, instead of the older tanning materials, was discovered as early as 1856 by a German chemist, but the first process which attained commercial success was invented in 1884 by Augustus Schultz. The introduction of this process in Philadelphia caused it to become at once a great leather-manufacturing centre. Chrome-tanning consumes only a few hours, as compared with weeks or months required by the older method, and it produces a leather which is extremely soft and pliable, of close texture, and thoroughly resistant to water. At the close of the nineteenth century two-thirds of the glazed kids made in the United States were chrome-tanned, but the process had not been applied successfully to sole-leather. The process consists in treating the skins at first with a weak solution of bichromate of potash, to which sufficient hydrochloric acid is added to liberate the chromic acid. Of course pickled skins may be used without the necessity of adding free acid. After the skins have taken up a bright yellow color, through their entire texture, they are drained and transferred to a bath of hyposulphite of soda, to which some acid is added to liberate sulphurous acid, which reduces the chromic acid to green chromic oxide. The sulphurous acid is at the same time oxidized to sulphuric acid, until the whole of the chromic acid is reduced. The leather so produced is of a pale bluish-green color. The combination of the hide fibre, or corium, with the chromium oxide is apparently more stable than its combination with tannin, and yields less to boiling water. The leather can also be dyed successfully if the dye is applied while the skin is still wet, but so great is its water-repellent character that, once dried, it cannot be wetted sufficiently to dye properly.

Tawing consists in dressing the skins in antiseptic materials, so as to preserve them from decay; but by this operation no chemical change is effected in the gelatin of the skin; hence, scraps and other wastes of tawed leathers can be used in the manufacture of glue. The preliminary process of cleansing and depiling is performed as for skins that are to be tanned. After thorough cleansing, the pelts are steeped in a pit filled with lime and water, being taken out from time to time and drained on sloping benches. When removed finally from the lime-pit, the skins are worked with the knife, to render them more supple, and are then put into the branning mixture. This consists of bran and water in the proportion of two pounds of bran to a gallon of water. From this mixture they are transferred to an alum bath in a wooden tumbler or drum. For every two hundred skins some twelve pounds of alum and two and a half pounds of salt, with twelve gallons of water, are used. After remaining in this mixture about five minutes they undergo what is called pasting. The paste is a mixture of wheaten bran and sometimes flour and the yolk of eggs, which the leather almost completely absorbs. Lastly the skins are dried and examined, and if satisfactory are dipped into pure water, and worked or staked by pulling them backward and forward on what is called a stretching and softening iron and smoothed with a hot smoothing-iron.

SHAMOYING is effected by treating the skin with oil. After the skins have been thoroughly cleansed with lime, and then by a bran drench to remove the lime, they, while still wet, are oiled with fish, seal, or whale oil to which a slight amount of carbolic acid is sometimes added. The oil works into the skin, displaces all the water, and becomes united with the material, rendering its texture peculiarly soft and spongy. Wash-leather or chamois-leather is so prepared, and for this purpose the flesh halves of split sheepskin are chiefly used.

The skins which form the staple of leather manufacture are those of the ox, cow, calf, buffalo, horse, sheep, lamb, goat, kid, deer, dog, seal, hog, walrus, kangaroo, and alligator. The term *pelt* is applied to all skins before they are converted into leather. When simply made into leather in the state we find in shoe-soles, it is called *rough leather;* but if in addition it is submitted to the process of currying, it is called *dressed leather*. *Hides* are the skins of large animals, as horses, cows, and oxen. The complete hides when rounded, with the cheeks, shank, etc., cut off, are called *butts;* the pieces cut off constitute the offal. *Skins* are all the lighter forms of leather, as sheep, goat, deer, including the skins of fur-bearing animals in which the fur is retained. *Kips* are the skins of yearlings and animals larger than calves. Alligator leather is chiefly used for small fancy articles. Only the skins of young alligators are used, and of these the backs are thrown away as too horny. Walrus and hippopotamus hides are tanned in considerable numbers for the use of cutlers and other workers in steel goods; buffing-wheels are made of them, often an inch thick, which are of great importance in giving the polish to metals and horn goods. Hog-skins are used for the manufacture of saddles and fancy articles. Dog-skins are used for gloves. The 'grain leather' of commerce is leather that has been made from the hides of neat cattle, split so thin by the splitting-machine as to be suitable for the same uses as are goat, calf, and various other skins which it is made to imitate.

Morocco leather, formerly an article of import from the Barbary Coast, is now prepared in the United States from goatskins; sheepskins are also used for imitation. It is always dyed on the outer or grain side with some color, and the leather-dresser in finishing gives a peculiarly ribbed or a roughly granulated surface to it by means of engraved boxwood balls which he works over the surface. Morocco has been largely superseded by glazed kid.

Russia leather is much valued for its aromatic odor, which it derives from the peculiar oil of the birch-bark used in tanning it. The fact that this odor repels moths and other insects renders this leather particularly valuable for binding books; a few books bound in Russia leather being effective safeguards against insect enemies in a library. It is also said to destroy or prevent the vegetable evil called mildew, to which books are so very liable.

Japanned leather, varieties of which are known as *patent* and *enamel* leather, which is largely used for fancy work and for shoes, is said to have been made in America as early as 1818, by Seth Boyden, of Newark; but it is only within recent years that the American product has approached in excellence that made in Germany and France. The European method of manufacture is described substantially as follows in the Twelfth United States Census *Bulletin on the Leather Industry* (No. 195: Manufactures, vol. ix., pt. 3): In the preparation of enameled leather, a foundation coat of lampblack mixed with linseed oil has been laid on the flesh side, since the infancy of the industry in Europe. Successive coats of this mixture are applied, the skin being allowed to dry and the surface ground down with pumice-stone after each coat. Then the skins are blackened again with a fluid black mixed with turpentine, and hung up to dry again. After the skins have been allowed to settle, being laid in a pile for about a month's time, or longer if possible, the leather is tacked on to a frame and receives a brush coat of varnish. A baking follows in an oven of moderate heat. The temperature is gradually raised and the baking continued three days. Exposure to the sun for ten hours completes the process. Recently American manufacturers have been making patent leather from chrome-tanned skins. The product is quite different, as is also the process employed. The leather is softer, more flexible, and takes a less brilliant polish than that made from bark-tanned leather, but it is much less likely to crack and is more suitable for shoes than the brittle and inflexible leather made by the older process.

Cordovan is made from horse-hide and is so called because it was first successfully tanned in Cordova, Spain. Most of the hides of commerce are taken from the wild horses of certain parts of South America. A portion of the skin, oval in shape, taken over the rump, about three feet long and half as wide, is all that is used for leather. Its distinctive quality is that it is nearly water-proof.

STATISTICS. According to the United States census for 1900, there were in this country, at the close of the century, 40,751 establishments devoted to various branches of leather manufacture. The amount of capital invested is given as $173,977,421 and the annual value of the product $204,038,127. Of this product leather goods to the value of $27,293,019 were exported, while $6,773,024 worth of leather goods were imported. The growth of the industry during the last half of the nineteenth century and its distribution into different branches is shown by the accompanying table.

	Year	Number of establishments	Capital	Wage-earners		Cost of materials used	Value of products
				Average number	Total wages		
Boots and shoes, factory product	1900	1,600	$101,795,233	142,922	$59,175,883	$169,604,054	$261,028,580
Leather, tanned, curried, and finished	1900	1,306	173,977,421	52,109	22,591,091	155,000,004	204,038,127
Saddlery and harness	1900	12,934	43,354,136	24,123	10,725,647	33,127,926	62,630,902
Leather goods, pocketbooks, trunks, and valises	1900	772	13,505,819	14,990	5,679,767	13,485,761	26,905,814
Boots and shoes, custom work and repairing	1900	23,560	9,262,134	9,698	4,128,361	8,288,664	26,550,678
Boot and shoe, cut stock	1900	842	7,003,080	6,155	2,230,691	17,800,282	23,242,892
Belting and hose, leather	1900	105	7,410,219	1,667	913,937	7,500,413	10,628,177
Boot and shoe uppers	1900	132	273,796	256	125,627	401,680	700,225
Total	1900	40,751	$356,581,838	251,920	$105,571,004	$405,208,784	$615,720,895
Boots and shoes, factory product	1890	2,082	$95,282,311	133,690	$60,667,145	$118,785,831	$220,649,358
Leather, tanned, curried, and finished	1890	1,749	97,653,898	42,095	21,090,176	122,221,982	171,063,387
Saddlery and harness	1890	7,931	35,346,620	22,672	10,908,918	24,674,225	52,970,801
Leather goods, pocketbooks, trunks, and valises	1890	613	11,148,694	10,074	4,448,796	8,785,822	18,814,885
Boots and shoes, custom work and repairing	1890	20,803	14,230,081	16,981	7,422,377	10,403,383	34,856,651
Boot and shoe, cut stock	1890	344	5,401,834	4,992	1,891,031	13,744,655	17,903,846
Belting and hose, leather	1890	93	4,973,420	1,342	780,615	6,132,704	8,633,684
Boot and shoe uppers	1890	317	1,216,026	1,353	609,324	1,902,926	3,343,002
Leather, dressed skins	1890	38	434,800	297	159,813	724,739	1,072,755
Total	1890	33,970	$265,687,684	233,496	$107,978,195	$307,376,267	$529,308,269
Boots and shoes, factory product	1880	1,959	$42,994,028	111,152	$43,001,438	$102,442,442	$166,050,354
Leather, tanned, curried and finished	1880	5,426	67,117,674	34,887	14,062,456	145,320,852	184,865,633
Saddlery and harness	1880	7,999	16,508,019	21,446	7,997,752	19,968,716	38,081,643
Leather goods, pocketbooks, trunks, and valises	1880	378	3,961,256	6,998	2,737,726	5,951,039	11,068,749
Boots and shoes, custom work, and repairing	1880	16,018	11,364,273	22,667	7,993,706	12,524,133	30,870,127
Boot and shoe, cut stock	1880	172	1,210,300	2,885	735,482	5,939,249	7,531,635
Belting and hose, leather	1880	97	2,749,299	1,229	607,287	5,021,203	6,531,249
Boot and shoe uppers	1880	81	209,264	437	170,425	448,104	790,842
Leather, dressed skins	1880	202	6,266,237	5,395	2,441,372	11,063,265	15,399,311
Total	1880	32,327	$152,380,350	207,096	$79,747,644	$308,679,008	$461,189,543
Leather, tanned, curried and finished	1870	7,459	$59,784,362	34,345	$14,108,201	$116,469,899	$154,377,625
Saddlery and harness	1870	7,607	13,935,961	23,557	7,046,207	16,068,310	32,709,981
Leather goods, pocketbooks, trunks, and valises	1870	295	2,638,389	4,329	2,171,416	3,889,695	9,091,543
Boots and shoes	1870	23,428	48,994,366	135,889	51,972,712	93,582,528	181,644,090
Belting and hose, leather	1870	91	2,118,577	808	454,187	3,231,204	4,558,043
Leather, dressed skins	1870	110	1,340,450	898	397,574	2,099,735	2,859,972
Total	1870	38,990	$128,812,105	199,826	$76,150,297	$235,341,371	$385,241,254
Leather, tanned, curried, and finished	1860	5,175	$33,908,170	26,145	$8,144,278	$49,534,318	$75,318,475
Saddlery and harness	1860	3,621	6,478,184	12,285	4,150,365	6,606,415	14,169,087
Leather goods, pocketbooks, trunks, and valises	1860	214	1,244,000	3,160	901,741	1,990,573	4,163,956
Boots and shoes	1860	12,486	23,357,627	123,026	30,938,080	42,728,174	91,889,298
Boot and shoe, cut stock	1860	1	25,000	15	8,184	31,400	149,740
Belting and hose, leather	1860	46	588,000	354	184,952	915,271	1,481,750
Leather, dressed skins	1860	13	117,450	101	31,230	278,341	380,272
Total	1860	21,556	$70,718,431	165,086	$44,308,830	$102,084,492	$187,552,528
Leather, tanned, curried, and finished	1850	26,664	$22,582,795	25,379	$6,492,130	$26,038,743	$42,932,528
Saddlery and harness	1850	3,515	3,969,379	12,958	3,154,008	4,427,006	9,935,474
Leather goods, pocketbooks, trunks, and valises	1850	165	522,610	2,142	543,840	1,056,835	2,213,363
Boots and shoes	1850	11,305	12,924,919	105,254	21,622,608	23,848,374	53,967,408
Belting and hose, leather	1850	8	40,800	39	15,208	111,785	160,500
Leather, dressed skins	1850	22	192,000	216	49,548	391,138	525,370
Total	1850	41,679	$40,232,503	145,988	$31,877,342	$55,873,881	$109,734,643

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LEATHERBACK, LEATHERY TURTLE, or LUTH. A large oceanic turtle (*Sphargis coriacea*) distinguished prominently by having the body incased by a leathery integument instead of a bony or horny 'shell.' This remarkable turtle has been observed in all the tropical seas, but is everywhere rare and is probably approaching extinction. It is more often seen in the western part of the Atlantic than elsewhere, and has been known to stray northward to Long Island and the coast of France. It exceeds all other turtles in size. The British Museum contains a specimen six and one-half feet long, the shell being four feet long. Such a specimen, it is believed, would weigh about 1000 pounds, and Agassiz relates that he saw some weighing more than a ton. The color is brown, more or less marked with yellow in youth. The head is very turtle-like; the tail has been almost lost. The fore flippers are broad and nearly as long as the body, while the hinder ones are broad, stout paddles, giving great swimming power, so that a dozen men have found it difficult to drag a hooked specimen up on a beach. This power is an adaptation to the almost continuous pelagic life led by the animal, which feeds principally on fish, crustaceans, mollusks, jellyfishes, and similar marine prey caught in the open sea or about submerged reefs. Its flesh is not of good taste, is rarely eaten, and is regarded by most persons as unwholesome. Its breeding habits are similar to those of other chelonians. Rather later in the season than the true turtles, it seeks a sandy shore or islet, and buries in the sand a great number of eggs. The young turtles seek the water as soon as hatched, but few survive to reach an age and size that make them safe against most enemies.

STRUCTURE AND AFFINITIES. These turtles differ widely from ordinary chelonians, and competent herpetologists differ as to their history and probable line of development. The factors in the discussion, and the varying views, are briefly presented by Hans Gadow in vol. viii. of *The Cambridge Natural History* (London, 1901). Gadow himself, supported by Boulenger, Cope, and others, believes Sphargis to be the sole remnant of a primitive group quite independent of the other chelonians, and constituting with its scantily known fossil ancestors an order, Athecæ, opposed to all remaining turtles (order Thecophora). (See TURTLE.) The opposite view is that the genus is a specialized offshoot from the typical Chelonia, and separable only as a family. The structure of this turtle is very peculiar, especially as to its 'shell.' This is not formed as in other turtles by an outgrowth of the spine, for it is nowhere in contact with the internal skeleton, except by a nuchal bone; but is a real integument, continuous all around the body, and forming a jacket. This jacket consists of a dense leathery skin, in which are deeply imbedded a mosaic of many hundreds of little polygonal bony plates fitted closely together, and at intervals rising into twelve longitudinal ridges —seven dorsal, and five lateral and ventral. In young specimens the entire shell is soft, but ossification proceeds with growth, and when mature the integument is almost rigid, though thin. Such an integument more closely resembles that of a crocodile than that of a true turtle; but Sphargis has a plastron and neural plate.

BIBLIOGRAPHY. Consult Gadow (above cited); Boulenger, *Catalogue of Chelonians in the British Museum* (London, 1889); Case, *Journal of Morphology,* vol. xv. (London, 1897); Hay, *American Naturalist,* vol. xxxii. (Philadelphia, 1898).

LEATHER-BEETLE. A dermestid beetle (*Dermestes vulpinus*), allied to the bacon-beetle (q.v.), whose grubs damage leather, even when made up into shoes, harness, etc.; they also damage silkworm cocoons, dried fish, and other dead animal matter. Its larvæ feed voraciously, molt six times, and reach a full growth, under favorable circumstances, in from two to three weeks. They are likely to crawl away from their food when ready to pupate, and make cells in wood or any near-by substance. The pupa stage lasts about two weeks. The best remedy is fumigation with bisulphide of carbon or hydrocyanic-acid gas.

LEATHER CLOTH. A coated or enameled textile fabric, intended to possess some of the good qualities of leather without being so costly. There is another patented form of leather cloth, however, which is in fact leather and not cloth. It consists of leather parings and shavings reduced to a pulpy mass and molded to any desired form. See ENAMELED CLOTH.

LEATHER-FISH. A filefish (q.v.).

LEATHER-FLOWER. A North American plant. See CLEMATIS.

LEATHERJACKET. A bluish and silvery carangoid fish (*Oligoplites saurus*), numerous in the tropical seas on both sides of America, but not valued as food. A kindred species, *Oligoplites saliens*, is called 'sauteur,' and both have many local names indicating swiftness and activity. See Plate of HORSE-MACKEREL.

LEATHERSTOCKING. The most familiar of the names given to Natty Bumppo, the hero of Cooper's pioneer romances, hence called the *Leatherstocking Tales.*

LEATHER TURTLE (so called from its coriaceous shell). (1) The leatherback (q.v.). (2) A soft-shelled turtle, especially those of the American genera Trionyx and Amyda. See SOFT-SHELLED TURTLE.

LEATHERWOOD (so called from the toughness of the bark), MOOSEWOOD, or WICOPY (*Dirca palustris*). A deciduous tree-like shrub from three to six feet high, native of North America, which belongs to the natural order Thymeleaceæ. The wood is white, soft, and very brittle. The bark is exceedingly tough, and has been used for ropes, baskets, etc. The leaves are lanceolate-oblong; the flowers, which appear before the leaves, yellow. The shrub, which abounds in rich moist woods from New Brunswick to Minnesota, and south to the Gulf of Mexico, is used to some extent in ornamental gardening.

LEATHES, lĕthz, STANLEY (1830-1900). An English theologian and Hebraist. He was born at Ellesborough, Buckingham; studied at Jesus College, Cambridge; and in 1863 was appointed to the chair of Hebrew in King's College, London. From 1870 to 1885 he was a member of the Old Testament Revision Committee. His skill as a Hebraist is to be seen in *A Short Practical Hebrew Grammar* (1869). Leathes was delegate to the Evangelical Alliance in New York in 1873. The last dozen years of his life were spent at Much Hadham, Hertford. He is best known for his lectures: *The Witness of the Old Testament to Christ* (1868); *The Witness of Saint Paul to*

Christ (1869); and *The Witness of Saint John to Christ* (1870), being Boyle Lectures; the Hulsean Lectures, *The Gospel Its Own Witness* (1874); and in the same year the Bampton Lectures, *The Religion of the Christ.* He also wrote *The Law in the Prophets* (1891) and *Testimony of the Earlier Prophetic Writers to the Primal Religion of Israel* (1898).

LEAVE AND LICENSE. A phrase in English law to denote that leave or permission was given to do some act complained of. It is a common defense in actions of trespass. See LICENSE.

LEAVEN, lĕv'en (OF., Fr. *levain,* from Lat. *levamen,* raiser, from *levare,* from *levis,* light; connected with Lith. *lengwus,* Gk. ἐλαχύς, *elachys,* Skt. *laghu, raghu,* light). Sour dough, or dough in which putrefaction has begun, and which, owing to the presence and rapid growth or multiplication of the yeast-plant, quickly communicates its character to fresh dough with which it is mingled, causing the process of fermentation to take place sooner than it otherwise would. The use of leaven in baking dates from a very remote antiquity; the employment of yeast is more recent. See YEAST; BREAD.

LEAVENWORTH, lĕv'en-wûrth. A city and the county-seat of Leavenworth County, Kan., 26 miles northwest of Kansas City; on the Missouri River, and on the Atchison, Topeka and Santa Fé, the Missouri Pacific, the Union Pacific, the Chicago, Rock Island and Pacific, the Burlington Route, the Chicago Great Western, and several other railroads (Map: Kansas, H 2). With these transportation facilities, it is an important commercial centre, its wholesale trade being prominent. There are also coal-mining interests and extensive manufactures, including vitrified and building bricks, stoves, furniture, machinery, flour, wagons, etc. The city has a public library, and among noteworthy structures the Cathedral of the Immaculate Conception, county court-house, and Federal building. In the suburbs are the United States and State penitentiaries, a home for disabled volunteers with a membership of 3700, and Fort Leavenworth (q.v.). The last, one of the most important military posts of the West, has a noted infantry and cavalry school, and a national cemetery in which are 3221 graves, 1445 of unknown dead. There are also in the city several hospitals and asylums, and two fine railroad and wagon bridges cross the river at this point. An object of particular interest is the immense bronze statue of Gen. U. S. Grant. The government is administered, under a charter of 1881, since frequently amended, by a mayor, elected biennially, a unicameral council, and subordinate officials—all, excepting the city clerk, attorney, and treasurer, who are chosen by popular election, being appointed by the executive subject to the consent of the council. The schools are governed by a board elected at large. Leavenworth was founded in 1854 by a party of so-called 'Sons of the South,' and throughout the struggle between the anti- and pro-slavery parties for the control of Kansas it was a centre of pro-slavery influence. In 1855 it was chartered as a city of the first class. Population, in 1890, 19,768; in 1900, 20,735. Consult Burke and Rock, *History of Leavenworth* (Leavenworth, 1880).

LEAVENWORTH, ELIAS WARNER (1803-87). An American lawyer. He was born in Canaan, N. Y., and graduated at Yale in 1824. He then studied law in the office of William Cullen Bryant at Great Barrington, Conn., and in the law school at Litchfield, Conn.; was admitted to the bar in 1827; removed to Syracuse, N. Y., in the same year, and there practiced his profession. He was twice Mayor of Syracuse (1849 and 1859); was Secretary of State of New York in 1854-55; was president of the Board of Quarantine Commissioners in 1860, and of the commission appointed to choose a location for the State asylum for the blind in 1865; and was a member of the State Constitutional Commission of 1872. In 1861 he was appointed by President Lincoln commissioner under the convention with New Granada, and from 1875 to 1877 he was a member of Congress. He published a *Genealogy of the Leavenworth Family in the United States* (1873).

LEAVENWORTH, FORT. See FORT LEAVENWORTH.

LEAVES OF GRASS. A collection of poems by Walt Whitman (1855).

LEAVITT, lĕv'ĭt, JOSHUA (1794-1873). An American religious journalist. He was born in Heath, Mass., September 8, 1794; graduated at Yale College in 1814; was admitted to the bar in 1819, and practiced for a time in Heath, Mass., and Putney, Vt. He graduated at the Yale Divinity School in 1825. About 1830, for the promotion of revivals of religion, many pastors adopted what were then called 'new measures,' such as the employment of 'evangelists,' the holding of 'protracted meetings,' 'inquiry meetings,' etc. The New York *Evangelist* was established to promote revivals and defend the 'new measures,' and from 1831 to 1837 Dr. Leavitt was its editor. During this period the anti-slavery agitation had its beginnings, and from the first it enlisted the warm support of Dr. Leavitt, who made the *Evangelist* a powerful agent for its promotion. When the American Anti-Slavery Society was organized in 1833 he became one of its most active and influential members. From 1837 to 1840 he was the editor of the society's weekly organ, the *Emancipator,* and a member of the executive committee. When the abolitionists divided in 1840, he went with the new organization, and thenceforth his anti-slavery efforts were mainly confined to the political arena. He was an active promoter of the 'Liberty' and the 'Free-Soil' parties. In 1848 he became office editor of the *Independent,* retaining a connection therewith to the day of his death. About 1834 he compiled and published *The Christian Lyre,* a work containing the great body of the hymns and tunes used in the revivals of that day. He died in Brooklyn, January 16, 1873.

LEB'ANON. A city in Saint Clair County, Ill., 24 miles east of Saint Louis, Mo., on the Baltimore and Ohio Southwestern Railroad (Map: Illinois, C 5). It has a large flouring-mill with elevators, a coal-mine, creamery, soda-water factory, brewery, and cigar-factories. McKendree College (Methodist Episcopal) was founded here in 1828. With its elevated situation, healthful climate, natural beauty, and the possession of fine mineral springs, the city is one of the popular summer resorts near Saint Louis. Lebanon was laid out in 1825, incorporated as a village in 1857, and chartered as a city in 1874.

There is a municipal electric-light plant. Population, in 1890, 1636; in 1900, 1812.

LEBANON. A city and the county-seat of Boone County, Ind., 26 miles northwest of Indianapolis; on the Cleveland, Cincinnati, Chicago and Saint Louis, and the Chicago and Southeastern railroads (Map: Indiana, C 2). It is supplied with natural gas, and has saw-mills, flour-mills, novelty-works, grain-elevators, etc. Lebanon, settled in 1824, is governed under a charter of 1875 which provides for a mayor, elected every four years, and a unicameral council. The city owns and operates its water-works. Population, in 1890, 3682; in 1900, 4465.

LEBANON. A city and the county-seat of Marion County, Ky., 67 miles southeast of Louisville; on the Louisville and Nashville Railroad (Map: Kentucky, F 3). It has Saint Augustine's Academy and Saint Augustine's Colored School, both Roman Catholic. The principal industries are farming, stock-raising, and manufactures of whisky, flour, meal, wheels, carriages and wagons, furniture, etc. The water-works are owned by the municipality. Population, in 1890, 2816; in 1900, 3043.

LEBANON. A city and the county-seat of Laclede County, Mo., 56 miles northeast of Springfield; on the Saint Louis and San Francisco Railroad (Map: Missouri, D 4). It is a health resort, well known for its mineral springs, and has a fine court-house. The centre of an agricultural, fruit-growing, stock-raising, and dairying district, Lebanon carries on considerable trade, and manufactures flour, lumber, bricks, machine-shop products, etc. Population, in 1890, 2218; in 1900, 2125.

LEBANON. A town and one of the county-seats of Grafton County, N. H.; 65 miles northwest of Concord; on the Connecticut River, and on the Boston and Maine Railroad (Map: New Hampshire, F 7). Good water-power, supplied by the Mascoma River, has aided the development of the town as a manufacturing centre. It is the seat of an extensive woolen industry, and has manufactures of wood and iron working machinery, men's clothing, watchmakers' tools, rakes, snow-shovels, scythes, doors, sash and blinds, etc. There are also saw and grist mills, a large brick-yard, and granite-works. These industries employ nearly a thousand persons, represent an invested capital of over $1,000,000, and have an annual output valued at more than $1,500,000. The government is administered by town meetings. Lebanon, named after Lebanon, Conn., was chartered July 4, 1761, and was settled in 1762. Population, in 1890, 3763; in 1900, 4965. Consult Patterson, *Oration in Commemoration of the One Hundredth Anniversary of Lebanon* (Boston, 1862).

LEBANON. A village and the county-seat of Warren County, Ohio, 30 miles northeast of Cincinnati; on the Cincinnati, Lebanon and Northern and the Dayton, Lebanon and Cincinnati railroads (Map: Ohio, B 7). It is the seat of the National Normal University, and has a Mechanics' Institute Library of about 4300 volumes, and an orphans' home. In the vicinity is a settlement of Shakers (q.v.). There are municipal water-works and electric-light plant. Lebanon was laid out in 1802; and the celebration of the centennial of this event on September 25-27, 1902, was a noteworthy occurrence in the history of the village. Population, in 1890, 3050; in 1900, 2867.

LEBANON. A city and the county-seat of Lebanon County, Pa., 26 miles east of Harrisburg; on the Philadelphia and Reading and the Cornwall and Lebanon railroads (Map: Pennsylvania, E 3). It is in the Lebanon Valley between the Blue and South mountains, a vicinity in which there is an abundance of brownstone, limestone, and brick-clay, and it is within five miles of the noted Cornwall iron-mines, a deposit of magnetite, covering an area of about 104 acres and having produced since its discovery 16,000,000 tons of ore, yielding 48 per cent. of iron. The principal industries are iron-mining, quarrying, brick-making, and manufactures of silk machinery, bolts and nuts, boilers, chains, stoves, cigars, and organs. The iron-works, rolling-mills, and furnaces are extensive; the nut and bolt plant ranks among the largest in the world; and the chain-works produce some of the most massive chains in use. There are four libraries in the city. Lebanon was laid out in 1753, having been settled some ten years earlier, was incorporated in 1820, and received a city charter in 1885. The government is vested in a bicameral council and in a mayor, chosen every three years, who, with the consent of the select council, appoints the highway commissioner, the boards of health and water commissioners. The board of school controllers is chosen by popular election. Lebanon owns and operates its water-works. Population, in 1890, 14,664; in 1900, 17,628.

LEBANON. A town and the county-seat of Wilson County, Tenn., 30 miles east of Nashville; on the Nashville, Chattanooga and Saint Louis Railroad (Map: Tennessee, E 4). It is the seat of Cumberland University (Cumberland Presbyterian), opened in 1842, and of Lebanon College, for young ladies. The town is surrounded by a productive farming country, in the products of which it controls a considerable trade, and has some manufactures. Population, in 1890, 1883; in 1900, 1956.

LEBANON, MOUNT (Lat. *Libanus*, Ar. *Jebel Libnân*, White Mountains). The western and higher of the two mountain chains of Syria. The eastern is known as Anti-Libanus (q.v.) or Anti-Lebanon, Arabic *Jebel esh-Sharki*, Eastern Mountains. Between the two is the tableland of el-Buka'a, called by the Greeks Cœle-Syria (hollow Syria). The Lebanon chain begins at the stream called Nahr el-Kebir north of Tripoli and extends southward parallel to the coast, a distance of not quite 100 miles to the point where the Litany breaks through on its way to the sea, not far from Tyre. Thence the chain is continued by the hills of Palestine—the mountains of Naphtali, Ephraim, and Judea of the Bible. The average height is about 7000 feet, the highest peaks, Jebel Makmal and Dahr el-Kodib, having an elevation of little more than 10,000 feet. The eastern slope is abrupt and barren; the western more gradual. Several spurs strike off across the strip of coast and end at the sea in bold promontories. The formation is limestone, sandstone, and basalt. Deep ravines and abrupt precipices are a feature of the landscape and the general appearance is barren and desolate. The mountains, once well wooded, are now quite bare. Of the famous cedars (see CEDAR for illustration) but a few groves remain. Iron and coal are found, also amber and asphalt. In winter the snowfall is great, and the snow lasts on the summits for six months; in the ravines it is found the year round, and is carried to Beirut and other cities in the heat of summer. Two important rivers rise in the mountains and flow through the Buka'a before turning westward to the sea, the Litany (Leontes) flowing southward and el-Asi (Orontes) flowing to the north. Numerous streams water the western slopes, and here and in the valleys the soil is fruitful; orchards, vineyards, olive and mulberry plantations, and fields of wheat and barley abound. Estimates of the population vary from 260,000 to 400,000. Three-quarters of them are Christians, of whom more than half are Maronites, Greek Catholics (orthodox and Uniates) coming next in order of numbers. The non-Christian inhabitants are the Druses (q.v.). The chief occupation is the rearing of silkworms and great quantities of raw silk are exported to Italy and France; some silk manufacture is also carried on in the villages, and there are several factories established by foreign firms. The carriage-road over the Lebanon from Beirut to Damascus is now supplanted by a narrow-gauge railway, opened in 1895. About 20 miles of it are cogged. The mountains do not contain many ancient remains. There are some early anchorites' caves and rock tombs. The Lebanon has always been in a measure independent of the Turkish Government. Since the massacres of the Christians in 1860 and the consequent French intervention (see Druses) it has had a Christian Governor under the protection of the Powers. The people are markedly superior to other inhabitants of Syria. Consult, besides the standard works on Palestine and Syria, such as Robinson, Buhl, and George Adam Smith, Fraas, *Drei Monate im Lebanon* (Stuttgart, 1876); Porter, *Handbook for Travelers in Syria and Palestine* (London, 1875).

LEBANON SPRINGS. A village of New York. See New Lebanon.

LEBANON VALLEY COLLEGE. A coeducational college at Annville, Pa., founded in 1867; and under the control of the United Brethren. The institution comprises five departments: a college, offering five groups of studies, leading to the degree of Bachelor of Arts, and preparatory, normal, music, and art departments. In 1903 the total attendance was 460, including 170 collegiate students, with 29 instructors. The library contained 10,000 volumes. The value of the buildings of the college and grounds was $150,000, the endowment $75,000, the gross income $23,000, and the total value of college property $230,000.

LE BAS, le bȧ, Philippe (1794-1860). A French archæologist and historian, born in Paris. From 1820 until 1827 he had charge of the education of Louis Napoleon, afterwards Napoleon III. Subsequently he was professor of Greek at the Lyceum and lecturer at the Normal School. In 1842 he was sent by the Government on an archæological expedition to Greece and Asia Minor. He was elected to the Institute in 1838. His works include: *Voyage archéologique en Grèce et en Asie Mineure* (1847-68), completed by Waddington; *Explication des inscriptions grecques et latines recueillies en Grèce* (1835).

LEBBÆ'US. See Thaddæus.

LEBEAU, le-bō′, Jean Louis Joseph (1794-1865). A Belgian statesman. He was born at Huy; practiced law at Liège; and through the Liberal organ, *Mathieu Laensbergh* (later *La Politique*), which he founded in 1824, brought about the union of the Liberals and Clericals for separation from Holland. Under Leopold he was Minister of Justice (1832-34), Governor of Namur, Ambassador to the German Confederation in 1839, Minister of Foreign Affairs (1840-41), and after returning to the House of Deputies, a leader of the Liberals and a strong opponent of the Clerical Party until his resignation in 1864. His *Souvenirs personnels* were edited by Freson (Brussels, 1883).

LE BEAU, Louise Adolpha (1850—). A German composer, born at Rastatt, Baden. She studied music with Kalliwoda, Frau Schumann, Sachs, Rheinberger, and Lachner. She was a brilliant concert pianist and gave successful concerts throughout Germany. Her compositions, especially for the piano, are popular. The best known of her works are: gavotte, for piano; fantasia, for piano and orchestra; several sonatas; and the choral work *Hadumoth* (1894).

LEBEDIN, lyĕ′be-dyēn′. The capital of a district in the Russian Government of Kharkov, about 105 miles northwest of the town of Kharkov (Map: Russia, D 4). It manufactures chiefly tallow and sugar, and carries on some trade in grain. Population, in 1897, 14,206.

LEBEL, le-bĕl′, Nicolas (1838-91). A French officer and inventor. He was born near Angers, graduated from the military school of Saint-Cyr in 1855, and took part as captain in the campaign of 1870 with the Army of the North. Later he was appointed director of the artillery school at Tours and in 1883 of that of Châlons, where he began to experiment on firearms. As a result he was commissioned to secure a new gun for the infantry. He invented a weapon of small calibre, which, after being perfected by others, was adopted by the French Army in 1886.

LEBERT, lā′bĕrt, Hermann (1813-78). A German physician. He was born at Breslau; was educated at Berlin, Zurich, and Paris; and in 1836 began to practice at Bex in Switzerland. The winters of 1842 to 1845 he spent in Paris in pathological research, especially microscopical, and published the results in *Physiologie pathologique* (1845). He settled in Paris in 1847 and stayed there until 1852, when he went to Zurich as clinical professor of the university. In 1859 he went to Breslau in the same capacity. He was one of the first to recognize and utilize the importance of histology for pathology. He made special studies of tuberculosis, cancer, and scrofula. His writings include: *Traité pratique des maladies scrofuleuses et tuberculeuses* (1849) and *Des maladies cancéreuses* (1851); *Traité d'anatomie pathologique générale et spéciale* (1855-60); *Allgemeine Pathologie und Therapie* (2d ed. 1876); *Klinik der Brustkrankheiten* (1873-74); and *Krankheiten des Magens* (1878).

LEBERT, Siegmund (1822-84). A German music-teacher, born at Ludwigsburg. After studying music at Prague he settled in Munich, where he established himself as a pianist and teacher. In 1856 he founded, in conjunction with Stark and others, the Stuttgart Conservatory.

In 1873 he received the honorary degree of doctor of philosophy from the University of Tübingen. He published, with Stark, *Grosse Klavierschule*, which was translated into Italian, English, French, and Russian; an edition of Clementi's *Gradus ad Parnassum;* and an instructive edition of pianoforte classics. He died at Stuttgart.

LEBID IBN RABIA. See Labid ibn Rabia.

LE BLANT, le blän, Edmond Frédéric (1818-97). A French archæologist, born in Paris. He became interested in archæology during a visit to Rome in 1847, and afterwards made a special study of Christian epigraphy and early Christian institutions in France. He became a member of the Institute in 1867, and from 1883 to 1889 was director of the French School at Rome. His works include: *Inscriptions chrétiennes de la Gaule antérieures au VIIIème siècle* (1856-65); *Nouveau recueil des inscriptions chrétiennes de la Gaule* (1862); *Manuel d'épigraphie chrétienne* (1869); *Etude sur les sarcophages chrétiens antiques de la ville d'Arles* (1878); *Les sarcophages chrétiens de la Gaule* (1886); *Les actes des martyrs*, a supplement to the *Acta Sincera* of Dom Ruinart (1882); *L'épigraphie chrétienne en Gaule et dans l'Afrique romaine* (1888); *Les persécuteurs et les martyrs aux premiers siècles de notre ère* (1893); and, with Jacquemart, *Histoire artistique de la porcelaine* (1861-62).

LE BLANT, Julien (1851—). A French historical painter, son of the preceding, born in Paris. He was a pupil of Girard, and gave special attention to the history of the Chouans. Many of his well-composed, dignified pictures celebrate their exploits. His works include: "L'assassinat de Lepelletier de Saint-Fargeau" (1874); "La mort du général d'Elbée" (1878); "Henri de la Rochejacquelin" (1879); "Dîner de l'équipage" (1884); and "Retour de régiment" (1892). He received a second-class medal in 1880, the Legion of Honor in 1885, and a gold medal at the Universal Exposition of 1889. He also made notable illustrations for the works of De Vigny, Dumas père, and Balzac.

LEBŒUF, le-bĕf', Edmond (1809-88). A marshal of France, born in Paris. He was educated at the Ecole Polytechnique and the school of artillery at Metz. He entered the army in 1832, and his services in Algeria (1837-41) made him colonel (1854). In that year he directed the French siege operations around Sebastopol, and was made brigadier-general. He was attaché of the Russian embassy in 1856; became general of division in 1857 and commander-in-chief of the artillery a year later, and did effective work with this arm at the battle of Solferino. In August, 1869, he became Minister of War, and in the spring of 1870 was made marshal. Before the outbreak of the Franco-German War, Lebœuf expressed his confidence in the preparedness of the French forces; summoned in April, 1870, before a committee of the French Legislative Assembly to report on the condition of the French Army, he said: "We are ready; so ready that the war may last two years without our having need to buy so much as a gaiter-button." Consequently, when the first disasters of the war revealed the true condition of affairs, the country was exasperated against him. He resigned from the Ministry in August, and assumed command of the Third Army Corps. He fought bravely at Vionville and Gravelotte, and with the fall of Metz became a prisoner of the Germans. After the peace he lived in complete obscurity. He died June 7, 1888.

LE BON, le bôN, Gustave (1841—). A French physician, archæologist, and ethnologist, born at Nogent le Rotrou. He was educated as a physician, but practiced little. In 1884 he had charge of a Government expedition to study the architecture of the Buddhist monuments in India. He wrote: *L'homme et les sociétés* (1877); *Les premières civilisations* (1889); *Les monuments de l'Inde* (1894); *Lois psychologiques de l'évolution des peuples* (1895); *La foule*, translated as *The Crowd: A Study of the Popular Mind* (2d ed. 1897).

LE BOULENGÉ, le bōō'läN'zhā', Paul Emile (1832—). A Belgian artillery officer, born at Mesnil-Eglise. He made many valuable discoveries in ballistics, especially the Le Boulengé chronograph, which he described in 1869, and wrote: *Etude de balistique expérimentale* (1868) and *Description, maniement et usage des télémètres de Le Boulengé* (1877). See Ballistics.

LEBRET, le-brā', Georges (1853—). A French statesman. He was born at Etampes, studied law at Paris, and received the degree of doctor of laws. In 1879 he was appointed by the Minister of Public Instruction on a mission to England and Scotland to report on leases, and agricultural legislation and usages. Afterwards he was made professor of law at the University of Caen, and attained a full professorship in 1885. He held the offices of municipal counselor and of mayor in the town of Caen, and in 1893 was elected Deputy (Republican) for that municipality. In 1898 he accepted the portfolio of Minister of Justice in Dupuy's Cabinet. Lebret became recognized as an authority on technical jurisprudence. His publications include *Etude sur la propriété foncière en Angleterre* (1882).

LEBRIJA, lā-brē'Hā (Lat. *Nebrissa-Veneria*). A town of Spain, in the Province of Seville, 34 miles south of Seville, and on the railway between Seville and Cadiz (Map: Spain, B 4). It is pleasantly situated on the fertile slopes of the Sierra de Gibaldin and on the border of the extensive marshes around the mouth of the Guadalquivir, known as Las Marismas. It has a ruined castle, believed to date from the time of the caliphate, and a large church, originally a mosque, exhibiting a strange combination of the Arabic, Roman, and Gothic styles. It carries on a considerable trade in grain, wine, oil, and cattle. Population, in 1887, 11,933; in 1900, 11,127. Lebrija is believed to have been founded by the Greeks in ante-Roman times, and was a large and flourishing city during the time of the Moorish Empire.

LEBRUN, le-brĕN', Charles (1619-90). A French historical and portrait painter, architect, and decorator. He was born in Paris, February 24, 1619. His predisposition toward art, which developed early, was discovered by the Chancellor Séguier, who placed him in the atelier of the painter Vouet, and in 1642 sent him to Rome. In Rome he came under the influence of Nicolas Poussin. In 1642 he was again in Paris, and was called upon to decorate the Hotel Lambert, and to repair the Petite Galerie du Louvre, which had been injured by fire. The restoration of the

Petite Galerie led to the construction of the Galerie d'Apollon above it, which Lebrun was employed to decorate. This work he left unfinished, but the numerous drawings from his designs which are in existence made it possible for Eugène Delacroix in the nineteenth century to complete the work according to the original intention.

The extraordinary power which Lebrun exercised during the reign of Louis XIV. came mainly from the part he played in the establishment of the Academy of Painting and Sculpture. He was also instrumental in the establishment of the French Academy at Rome, and until his death was practically Minister of Fine Arts to the King, having the supervision of all his immense artistic undertakings.

After the completion of the Hotel Lambert, Lebrun was employed by the Chancellor Fouquet to decorate the new Château of Vaux-le-Vicomte, designed by Louis Levau. In 1662 he was appointed first painter to the King, and placed in charge of the decoration of the palace and park of Versailles. He designed the fountains and statues of the park, decorated the vestibule of the palace, and in 1679 began the decoration of the great gallery with paintings of the deeds of Louis XIV. He was made director of the new manufacture of tapestries and furniture at Les Gobelins. He decorated the Château des Sceaux for Colbert and designed some of its pavilions. Next to Versailles, Lebrun's most important work was the construction and decoration of the Château of Marly, which has been destroyed, but many of his designs for the architecture have been preserved. After the death of Colbert his fortunes declined, and in consequence of the troubles brought upon him by the enmity of Louvois, Lebrun sickened and died, on February 12, 1690.

He was an able and prolific painter, and his works show good composition and great inventive power. Although of good decorative effect, they are mannered; his drawing is superficial, and his coloring untrue to nature. The Louvre contains a large number of his works, the best known of which is the series of five pictures illustrating the "History of Alexander the Great." He is well represented in most of the principal European museums, especially in those of France.

Consult: Henri Jouin, *Charles Lebrun et les arts sous Louis XIV.* (Paris, 1890); Merson, "Charles Lebrun," in the *Gazette des Beaux-Arts* (1894); Genevay, *Le style Louis XIV., Charles Lebrun, décorateur* (Paris, 1885).

LEBRUN, or **LE BRUN,** CHARLES FRANÇOIS, Duke de Piacenza (1739-1824). A French statesman, born at Saint-Sauveur-Landelin, in the Department of Manche. He began public life as secretary to the future Chancellor Maupeou, was made inspector of the Crown lands, and indirectly exercised great influence on the policy of the Ministry of Louis XV. After the dismissal of the Maupeou Ministry, in 1774, Lebrun was in retirement till 1789. At the outbreak of the Revolution he wrote a pamphlet entitled *La voix du Citoyen*, and was elected to the States-General, and in the Constituent Assembly he spoke often on matters of finance. He was made Governor of the Department of Seine-et-Oise in 1791, and distinguished himself by an orderly and vigorous administration. Twice arrested during the Terror, he was freed in 1795, and elected Deputy to the Council of Five Hundred, becoming president in the following year. In 1799 he was reëlected, acquired a commanding influence in that body, and controlled its financial legislation. After the 18th Brumaire Napoleon made Lebrun Third Consul for his services during the coup d'état. In 1805 he negotiated the union of the Ligurian Republic with the French Empire, and was made Duke of Piacenza. In 1807 he reorganized the Cour des Comptes (the exchequer), but on the abolition of the *tribunat* by the Emperor retired to private life. He was called back in 1810 at the age of seventy-one to govern Holland after the abdication of Louis Bonaparte. He returned to Paris in 1813, and soon after, for his services to the Bourbons, was raised to the peerage. He went over, however, to Napoleon during the Hundred Days, and on the return of the Bourbons his name was struck from the list of peers, but restored in 1819. Lebrun published translations of Tasso's *Gerusalemme Liberata*, the *Iliad*, and the *Odyssey*. His *Memoirs* appeared in 1829.

LEBRUN, MARIE LOUISE ELISABETH VIGÉE (1755-1842). A French portrait painter. She was born in Paris, April 16, 1755. When fifteen years of age she had established herself as a portrait painter. In 1775 she was elected member of the Academy of Saint Luke, at Rome, and in 1783 a member of the French Academy. In 1776 she contracted an unfortunate marriage with Lebrun, a spendthrift and a man much older than herself. She was appointed painter in ordinary to Marie Antoinette, and in 1779 commenced the series of thirty portraits of the Queen. She became a great favorite of society. At the time of the Revolution she fled to Italy, visiting Bologna, Florence, Rome, Naples, and then went to Saint Petersburg, where she remained five years. She was everywhere received with high honor, admitted to membership of the principal academies, and abundantly employed. After an absence of twelve years she returned to Paris, and in 1802 she visited England, remaining three years. She also visited Holland, Belgium, and Switzerland, making her home alternately in Paris and Louveciennes. She died in Paris, at the age of eighty-seven, March 30, 1842.

Madame Lebrun's figures are well posed, and although the composition is sometimes conventional, there is always elegance and refinement in her paintings. Her technique is most careful in finish, her drawing is good, and her color is pleasing, reminding of Greuze. Among the best of her portraits are those of Madame Lebrun and her daughter; Jean Paesiello; the painter Hubert Robert; Joseph Vernet (Louvre); Madame Molé-Raymond; Prince of Wales (George IV.); Lord Byron; Marie Antoinette and her three children (Versailles Museum). Consult Madame Lebrun's *Souvenirs de ma vie* (Paris, 1869).

LEBRUN, PIERRE ANTOINE (1785-1873). A French poet and dramatist, born in Paris. During the campaigns of the Empire his patriotic odes *A la grande armée* (1805), *Sur la campagne de 1807* (1808), and on kindred subjects attracted considerable attention, and his plays won him a place in the Academy (1828). Among these plays may be mentioned *Ulysse* (1815), *Pallas* (1822), and especially *Marie Stuart* (1820). His poem *Voyage en Grèce* was published in 1828, and his works were collected in 1844-63.

LEBRUN, Ponce Denis Ecouchard (called Lebrun-Pindare) (1729-1807). A French poet, born in Paris. He was educated at the Collège Mazarin, and early began to write verses. Afterwards he became secretary to the Prince de Conti. He lived in the gay literary society of the time, wrote letters and exchanged epigrams, and won the title of Pindar for the perfection and imagination displayed in his odes. He lacked the warmth and real feeling to make him a great poet, but his epigrams are models. His works were published with a notice by Ginguené in 1811, and his *Œuvres choisies*, with a biography by Desprez and Campenon, in 1821 and 1828.

LE CARON, le kȧ′rôN′, Joseph (?-1632). A French Récollet missionary to the Indians in America. He went with three other Récollets to Canada in 1615; with other Franciscans built a monastery near Quebec; and penetrated in the same year to Lake Huron, which he was the first white man to reach. His mission was unsuccessful, as was a second attempt in 1623. He was sent to England after the capture of Quebec in 1629, and never succeeded in getting back to Canada. His studies of the Huron language were of value to his successors.

LECCE, lĕ′chȧ. Capital of the Province of Lecce, Italy, 24 miles by rail south of Brindisi, and seven miles from the Adriatic (Map: Italy, N 7). Electric cars carry excursionists to Castello di San Cataldo on the coast. Interesting buildings are the sixteenth-century Church of Santa Croce; the sixteenth-century Prefettura, formerly a Celestine convent, containing a valuable collection of ancient vases, coins, and inscriptions; the seventeenth-century baroque Church of San Domenico; the sixteenth-century hospital; the seventeenth-century cathedral; and in the Campo Santo (cemetery) the Church of Santi Nicola e Cataldo, built by the Norman Count Tancred in 1180. The streets are narrow and crooked. Lecce has a public garden, a chamber of commerce, a technical school, a gymnasium, a female normal school, a technical institute, a school of agriculture, and a provincial library. It is famous for the high quality of its oil and for the great tobacco factory in what was once a Dominican convent. It has cotton, wool, soap, and leather manufactures, and the country produces grain, fruit, honey, cotton, hemp, tobacco, cattle, and sheep. The ancient city here was called Lupia, and in near-by Rudiæ (now the village of Rugge) Ennius (q.v.) was born in B.C. 239. Population (commune), in 1881, 25,934; in 1901, 32,687. Consult Simone, *Lecce e i suoi dintorni descritti ed illustrati* (Lecce, 1874).

LECCO, lĕk′kō. A city in the Province of Como, Italy, on the southeastern arm (called Lake of Lecco) of Lake Como (q.v.), 32 miles by rail north of Milan (Map: Italy, D 2). It has statues of Garibaldi and of Manzoni, in whose *I Promessi Sposi* the locality is beautifully described. Over the Adda, which issues from Lake Como here, there is a ten-arch stone bridge, with towers at each end, built in 1335. There are a city hospital, an orphan asylum for girls, a technical school, an industrial school, a city library, a theatre, and a chamber of commerce and arts. Industrially Lecco is important for its silk, cotton, and iron manufactures, and cattle market. Population (commune), in 1881, 8042; in 1901, 10,275. In the Middle Ages the city was a fortified place and the seat of a count until the twelfth century, when it came into the possession of Milan. April 26, 1799, the French under Serrurier were defeated here by the Austrians and Russians.

LECCO, Lake of (It. *Lago di Lecco*). The southeastern arm of Lake Como (q.v.), Italy.

LECH, lĕk (Lat. *Licus*). A right tributary of the Danube. It rises in the Lake of Formarin in Vorarlberg, Tyrol, at an altitude of about 6000 feet (Map: Germany, D 4). Its course in the mountain ranges of Tyrol is tortuous and swift, and on entering Bavaria it forms the finest rapids in Germany. Even in its course through Bavaria, the river retains the character of a mountain stream. It joins the Danube at the ruined Castle of Lechsend after a course of about 180 miles and a total descent of over 4600 feet. Its chief tributaries are the Vils and the Wertach. Here, in 1632, Gustavus Adolphus defeated the Imperialists under Tilly, who was mortally wounded. See Lechfeld.

LECHEVALIER, le-she-vȧ′lyȧ′, Jean Baptiste (1752-1836). A French archæologist. He was born at Trelly, Normandy, France, and was educated for the ministry. In 1784 he accompanied the Count of Choiseul-Gouffier as secretary to the Levant, and with him made diligent researches in the plain of Troy (1784-86). He was director of the library of Sainte Geneviève in Paris from 1808 until his death. Of his works, the best known are his *Voyage dans la Troade* (1800; translated into English by Dalzel, under the title of a *Description of the Plain of Troy*); and *Ulysse-Homère* (1829), in which he asserts that Ulysses was the author of the *Iliad* and the *Odyssey*. Consult Noël, *Jean-Baptiste Lechevalier* (Paris, 1840).

LECHFELD, lĕK′fĕlt. A plain in Bavaria, south of Augsburg, on the banks of the river Lech, where Otho the Great in 955 inflicted a crushing defeat upon the Hungarians or Magyars. This defeat checked their incursions, and caused them to give up their plundering expeditions, which had long been a scourge to Europe, and especially to Germany.

LECH′FORD, Thomas (?-c.1645). The first lawyer in Boston. Before leaving England he was a member of Clement's Inn, and it was probably the assistance which he gave to a barrister named Prynne, who was found guilty of libel by the Star Chamber, that got him into trouble with the home authorities and led to his seeking an asylum in America, where he arrived in 1638. The Massachusetts Government also looked upon him with small favor, not because of his politics, but because of his profession and his religious views. Unable to secure any cases in the courts, he was, to quote his own words, "forced to get his living by writing petty things, which scarce found him bread." After three years of this unhappy existence, he returned to England in 1641, and there published a book entitled *Plain Dealing; or, News from*

New England (1642), which contains much valuable information relating to colonial life in early Massachusetts. It was reissued in 1644 under the title *New England's Advice to Old England*, and again in 1867 with notes and an introduction by J. Hammond Trumbull. He also wrote a journal of his life in Boston. Of his adventures after his return nothing is known except what is contained in the single phrase of John Cotton's that he "put out his Book (such as it is) and Soon after dyed."

LECHLER, lĕk′lĕr, GOTTHARD VICTOR (1811-88). A German Protestant theologian, born at Kloster Reichenbach. He studied at Tübingen (1829-34); in 1853 was made dean of the Diocese of Knittlingen; and in 1858 became pastor at Saint Thomas and professor at Leipzig. He took some part in politics as a member of the First Chamber of the Saxon Parliament. In 1880 he became ecclesiastic privy councilor, and three years afterwards retired from his duties as pastor. His works include: *Geschichte des englischen Deismus* (1841); *Das apostolische und das nachapostolische Zeitalter* (1851; translated into English from the third German edition by Lorimer, 1886); *Geschichte der Presbyterial- und Synodalverfassung seit der Reformation* (1854); *Der Kirchenstaat und die Opposition gegen den päpstlichen Absolutismus im Anfange des vierzehnten Jahrhunderts* (1870); *Johann von Wiclif und die Vorgeschichte der Reformation* (1873; translated by Lorimer, 3d ed. 1884); and *Johannes Huss* (1890).

LECK′Y, WILLIAM EDWARD HARTPOLE (1838-1903). An English historian and publicist. A native of Ireland, Lecky was educated at Trinity College, Dublin, and published his first work, *The Leaders of Public Opinion in Ireland*, anonymously, in 1861. In 1865 the issue of his *History of the Rise and Influence of the Spirit of Rationalism in Europe* made a marked impression on tne literary world, mainly on account of the evidence which it afforded of extraordinary erudition and profound contemplation. This impression was sustained by his subsequent work, *History of European Morals from Augustus to Charlemagne* (1869), though in a less degree, on account of the nature and scope of its subject. Nearly ten years were employed by Lecky in studies and investigations preparatory to the publication of his *History of England in the Eighteenth Century* (1878-90). The first three of these books were translated into German by Dr. H. Jolowicz, and the *History of Morals* is used as a text-book in German universities. He was elected to Parliament for Dublin University in 1895. New editions of his histories of England (7 vols.) and Ireland (5 vols.) were published in New York in 1893; and his later works include *Poems* (1891); *The Political Value of History* (1893); *Democracy and Liberty* (1896). After 1886 he spoke and worked for the Liberal Unionists.

LECLAIRE, le-klâr′, EDMÉ JEAN (1801-72). The founder of profit-sharing, born in France. He started in business as a painter in Paris in 1827 and was very successful. The idea of profit-sharing was first suggested to him in 1835, and in 1842 he announced his purpose to share the profits of his establishment with his employees, and soon divided 11,866 francs among them (about $50 each), the sums varying according to the yearly wage. In 1838 he had established a mutual aid society, which was reorganized in 1853, from which date it was maintained out of the profits of the establishment instead of from contributions of members. In 1864 retiring pensions were substituted for the right to a division of the funds of the mutual aid association. He became the Maire of Herblay in 1865, and died there August 10, 1872. The month before his death the Maison LeClaire divided $10,000 among 600 workmen. The company which he founded is still prosperous, and continues to follow the plan of distribution instituted by LeClaire. See PROFIT-SHARING.

LE CLEAR, le klĕr, THOMAS (1818-82). An American portrait painter, born in Owego, N. Y. He was self-taught, and first painted portraits, while living in London, Can., about 1832. Afterwards he lived principally in New York City, and was made an N.A. in 1863. Among his genre pictures are "Marble Players," "The Itinerant" (1862), and "Young America." His portraits, which are faithful and expressive likenesses, include those of "Millard Fillmore," "Bayard Taylor," "Daniel Dickinson" (1870), "Parke Godwin" (1877), "William Page," in the Corcoran Gallery at Washington; "William Cullen Bryant" (1880), "S. R. Gifford" (1881), and "George Bancroft," in the Century Club, New York City.

LECLERC, le-klâr′, CHARLES VICTOR EMMANUEL (1772-1802). A French general, born at Pontoise, in the Department of Seine-et-Oise. He joined the cavalry service in 1792, and at the siege of Toulon attracted the attention of Bonaparte, who took him to Italy as his adjutant in 1796 and made him brigadier-general. Soon afterwards he married Pauline Bonaparte. He accompanied Napoleon to Egypt, returned with him, and helped him on the 18th Brumaire. In 1800 he fought at Fleurus and Hohenlinden. In 1801 he was dispatched with an army of 20,000 men against Toussaint l'Ouverture, the negro Governor of Haiti. After losing half his army he forced Toussaint to capitulate. The great negro leader was subsequently seized and sent to France. Leclerc was presently stricken down with yellow fever, and died in December, 1802.

LE CLERC, le klĕrk, JEAN, or JOHANNES CLERICUS (1657-1736). A Swiss Protestant scholar. He was born at Geneva, where his father was professor of Greek. From an early period he showed a particular aptitude for the study of ancient languages. He also paid great attention to theology. Before he was twenty, Le Clerc had imbibed Socinian opinions in religion. He also denied the special inspiration of the Bible. In 1678 he went as tutor to Grenoble; in 1680 he returned to Geneva, and was ordained a minister. All the while his objections to the accepted theology of his associates had been growing; and under the name of Liberius de Sancto Amore he wrote eleven letters against the errors of the scholastic theologians as the partisan of the Dutch Remonstrants. In the latter part of 1681 Le Clerc returned to Grenoble, and thence went to London, where he preached six months to the Savoy Congregation. He was appointed professor of philosophy, classical literature, and Hebrew at the Remonstrant Seminary of Amsterdam in 1684; later (1712) of Church history. He had to retire in 1728 in consequence of a paralytic stroke, and for eight years before his death was much weakened in mind. He died January 8, 1736. Le Clerc's writings are very numerous; seventy-three separate publications have been enumerated, including a commentary on the entire Bible; but his greatest service to posterity was the publication of a quarterly, the *Bibliothèque universelle et historique* (1686-93, 25 vols.), followed up by the *Bibliothèque choisie* (1703-13), and the *Bibliothèque ancienne et moderne* (1714-27). His editions of several of the ancient classics and of the Apostolic Fathers (1698; 2d ed. 1724) prove both his learning and acumen; while his *Ars Critica* (3 vols., 1712-30) had considerable influence in his time, and is still not without value. His collected works appeared at Amsterdam in four volumes. A number of his writings were published in English during his lifetime. Consult Van der Hoeven, *De Johanne Clerico* (Amsterdam, 1845).

LECLERC, JOSEPH VICTOR (1789-1865). A French classical scholar, born in Paris. In 1824 he was called to the chair of Latin eloquence at the Faculté des Lettres of Paris, and in 1834 he was admitted to the Academy of Inscriptions. His chief publications were his *Nouvelle rhétorique française* (1822, 11th ed. 1850); *Des journaux chez les Romains* (1838); and a translation of Cicero, *Œuvres complètes de Cicéron* (30 vols., 1821-25; 2d ed., 35 vols., 1823-27). He also edited volumes xx., xxi., xxii., and xxiii. of the *Histoire littéraire de la France* (1842-56). Consult Renan, "Joseph Victor Leclerc," in the *Revue des Deux Mondes* (1868).

LECLERC, SÉBASTIEN (1637-1714). A French engraver, born in Metz. He received his only instruction from his father, a jeweler, and began to execute plates at an early age, although he later devoted himself principally to engineering and mathematics. In 1660 he was appointed civil engineer to the Maréchal de la Ferté, but Lebrun induced him to return to his original profession of engraving. In 1670 he received lodging at the Gobelins, in the same year became cabinet engraver, and in 1672 entered the Royal Academy, where he was professor of geometry and perspective. Leclerc left a large number of plates. His smaller pieces are the best, and reveal his facility for design, and the precision and brilliancy of his style. The most noted of his plates are 39 for Benserade's *Ovid* (1676); "The Passion," 36 plates, five large plates after Lebrun (1680-82); "Les grandes conquêtes du roi" (1687); and "Les petites conquêtes du roi (1702). He wrote: *La pratique de la géométrie* (1669); *Discours touchant le point de vue* (1679); *Traité de perspective*, never published; *Traité d'architecture* (1714); and *Nouveau système du monde conforme à l'Ecriture sainte* (1706). Jombert published a catalogue of his plates in 1774.—His son SÉBASTIEN (1676-1763) was a painter, and his grandson, JACQUES SÉBASTIEN, was professor at the Royal Academy. Consult: Meaume, *Sébastien Leclerc et son œuvre* (Paris, 1877).

LECLERCQ, le-klĕrk′, MICHEL THÉODORE (1777-1851). A French dramatist, born in Paris. From 1810 to 1819 he held a small office in the revenue service. He wrote short stories and the novel *Le château de Duncan*, but is best known for his *Proverbes dramatiques*, salon comedies, written in the style of his predecessor Carmontel, and marked by piquant dialogue and vivid character-portrayal. These include *L'humoriste*, *L'intrigant malencontreux*, and *Le retour du baron*. A collected edition was published in 1823-26, and *Nouveaux proverbes dramatiques* in 1833.

LECLERCQ, PAUL JEAN EMILE (1827—). A Belgian author, born at Monceau-sur-Sambre. He studied painting under Navez, but soon turned to art criticism and literature. His realistic novels include: *Le caméléon* (1858); *Les amours sincères* (1860); *Les petits-fils de don Quichotte* (1867); *Une fille du peuple* (1874); *A quelque chose malheur est bon* (1879); and *Gaillard frère et sœur* (1888). His critical and historical works are: *Le second Empire français* (1872); *Caractère de l'école française moderne de peinture* (1881); and *Les héros et les dieux, d'après les récits homériques* (1898).

LECLERCQ, ROSE (1846-99). An English actress. She was born in Liverpool, of a theatrical family. After appearing in London as a dancer, she made, in 1861, a hit in Brougham's *Playing with Fire*. The following years brought her popularity in many parts, such as Eliza in *After Dark* (1868), Claire in *The Shaughraun* (1875), and more recently Lady Bawtrey in *The Dancing Girl* (1891). Among her Shakespearean rôles were Desdemona, Mrs. Ford, and later Mrs. Page in *The Merry Wives of Windsor*, and Olivia in *Twelfth Night*. She died in London, March 25, 1899.

LE CLERQ, CHRÉTIEN (c.1630-c.1695). A French missionary, born at Artois. He was an ardent member of the Récollet Order of Franciscans, and in 1655 went as a missionary to Canada. After six years of labor among the Indians, on the island of Gaspé, he returned to France, got permission to build a house for the Récollets in Montreal, and returned to Gaspé in 1662; but from that time on accomplished little in his missionary labors. Afterwards he returned to France, and became guardian of the Convent of Lens. He wrote *Nouvelle relation de la Gaspésie* (1691), and *Establishment of the Faith in New France* (English translation by John G. Shea, 1881). His history is of no great value, as it deals only with the work of Frontenac, who opposed the Jesuits and favored the Récollets, and from the ecclesiastical side is tinged with partisanship.

LECOCQ, le-kŏk′, ALEXANDRE CHARLES (1832—). A French musical composer, born in Paris. He was a pupil of the Conservatory, and won the prize for harmony in 1850. He began almost immediately to write the light operetta with which his name has become so wedded. *Fleur de thé* (1868) was his first real success, soon followed by his most popular work, *La fille de Mme. Angot* (1873); *Giroflé-Girofla* (1874), *La jolie Persane* (1880), *L'oiseau bleu* (1884), and many others came in rapid succession. His music is always melodious, gay, and lively. Other and smaller compositions include songs and salon music.

LECOMP′TON. A city in Douglas County, Kan., 11 miles west by north of Lawrence; on the Kansas River, and on the Atchison, Topeka and Santa Fé Railroad (Map: Kansas, G 3). It is the seat of Lane University, founded in

1865. Lecompton (named in honor of Judge S. D. Lecomte, prominent in the early history of Kansas) was settled in 1854 by pro-slavery men, and during the contest for the control of Kansas between the pro-slavery and 'free-State' settlers, was the headquarters of the former. It was here that in October-November, 1857, the convention met which drew up the Lecompton Constitution (q.v.). (See Kansas.) Population, in 1890, 450; in 1900, 408.

LECOMPTON CONSTITUTION. In American history, a form of government for the State (then the Territory) of Kansas, adopted by a convention, of disputed legality, held at Lecompton, Kan., October-November, 1857. The Lecompton Constitution declared the right of slaveholders in Kansas to their slaves to be inviolable, prohibited the Legislature from passing any act of emancipation, and forbade any amendment of the instrument before 1864. The Constitution itself was not submitted even in form to the people; they were only to be allowed to vote upon the question whether they would have the 'Constitution with slavery' or the 'Constitution with no slavery,' the instrument being so worded that in either case it would fasten slavery upon the State, there being a clause to the effect that the right to slaves already held in Kansas was inalienable. The Constitution was thus formally submitted to the electors December 21, 1857. For its adoption 'with slavery' the vote returned was 6266, more than half of which was from the counties along the Missouri border, whose whole number of voters, according to the census, did not exceed 1000. For the Constitution 'with no slavery' 569 votes were returned, but the great body of the free-State men declined to vote at all, regarding the election as a fraud and a farce. The legally constituted Territorial Legislature, controlled by the free-State men, submitted the same instrument to the consideration of the people of Kansas, January 4, 1858, and the result was a vote of 10,226 against it, and of less than 200 in its favor. The question was carried to Congress, where the Senate voted to admit Kansas with this Constitution. The House, however, rejected this bill, and after a conference of committees both Houses agreed on the so-called English Bill. This, among other things, provided for a second submission of the Lecompton Constitution, the acceptance of which by the people was made a *sine qua non* as regards the immediate admission of Kansas into the Union. On August 2, 1858, the Constitution was again rejected by a majority of 10,000. This virtually ended the struggle for the establishment of slavery in Kansas. An anti-slavery Constitution was framed and adopted in 1859, and the State was admitted to the Union, January 29, 1861. See Kansas.

LECOMTE DU NOUY, le-kôɴt′ dụ nōō′ē′, Jules Jean Antoine (1842—). A French historical and genre painter, born in Paris. He was a pupil of Gleyre, Gérôme, and Signol at the Ecole des Beaux-Arts, where he won the second Prix de Rome in 1865 with his "Death of Jocasta" (Arras Museum). This was followed by "Invocation of Neptune" (1866, Lille Museum), and among his subsequent productions exhibited annually in the Salon are to be especially noted "Love Which Passes and Love Which Remains" (1869, Boulogne Museum); "The Sorcerer" (1870, Rheims Museum); "Bearers of Evil News Before Pharaoh" (1872, Luxembourg). In fresco, he painted "Two Episodes in the Life of Saint Vincent de Paul" (1876-79), in the Church of the Trinity, Paris. Although somewhat conventional in style and dull in coloring, all his works are to be commended for correct drawing, subtle characterization of the figures, and sound archæological knowledge. He painted also excellent portraits, was awarded medals in London (1862), Paris (1866, 1869, and 1872), and Vienna (1873), and decorated with the Legion of Honor in 1876.

LE CONTE, lė kōnt′, John (1818-91). An American physicist, the son of Lewis Le Conte. He was born in Liberty County, Ga.; graduated at Franklin College (now the University of Georgia) in 1838, and at the College of Physicians and Surgeons, New York, in 1841; became professor of natural philosophy and chemistry in Franklin College in 1846, and resigned in 1855 to become lecturer on chemistry in the College of Physicians and Surgeons, New York. In 1856 he became professor of natural and mechanical philosophy in South Carolina College, at Columbia; in 1869 he was appointed professor of physics and industrial mechanics in the University of California, at Oakland; in 1876-81 was president of that institution, and in 1881 resumed the chair of physics there. He was a member of the principal scientific associations, and published, besides numerous papers and magazine articles, *Philosophy of Medicine* (1849) and *Study of the Physical Sciences* (1858).

LE CONTE, John Eaton (1784-1860). An American naturalist, brother of Lewis Le Conte. He was born in Shrewsbury, N. J.; entered the United States Army in 1813 as a topographical engineer, and made many surveys and plans for fortifications until 1831, when he was retired with the rank of major. He devoted much of his time to extensive studies in natural history, and published: *Monographs of North American Species of Utricularia, Gratiola, and Ruellia;* "Observations of the North American Species of Viola," and "Descriptions of the Species of North American Tortoises," in the *Annals of the New York Lyceum of Natural History;* "A Monograph of North American Histeroides," in the *Boston Journal of Natural History;* and "Descriptions of Three New Species of Arvicola, with Remarks Upon Other North American Rodents," in the *Proceedings of the Academy of Natural Science of Philadelphia.*

LE CONTE, John Lawrence (1825-83). An American entomologist, son of Major John E. Le Conte. He was born in New York City, and graduated at Mount Saint Mary's College, Emmitsburg, Md., in 1842, and at the New York College of Physicians and Surgeons, New York, in 1846. He made scientific excursions in Western States when a student, and afterwards traveled extensively in North and Central America, transmitting the results of his observations to scientific societies. He entered the army as surgeon of volunteers in 1862, and was promoted to medical inspector in the Regular Army with the rank of lieutenant-colonel, which position he retained until the end of the war. In 1873 he was elected president of the American Association for the Advancement of Science.

He devoted his attention particularly to the study of entomology, and became widely recognized as an authority in that subject. In the Collections of the Smithsonian Institution are published his *Classification of the Coleoptera of North America* (part i. 1862; part ii. 1873); *List of Coleoptera of North America* (1866); and *New Species of North American Coleoptera* (part i. 1866; part ii. 1873).

LE CONTE, JOSEPH (1823-1901). An eminent American geologist, the son of Lewis Le Conte. He was born in Liberty County, Ga., and graduated at Franklin College in 1841. After receiving a medical degree at the College of Physicians and Surgeons in New York City, he practiced as physician for a time at Macon, Ga. In 1850 he entered Harvard University for the purpose of studying under Agassiz, and accompanied the latter on a scientific and exploring expedition to Florida. After finishing his course of study, he served successively as professor of natural sciences in Oglethorpe University, professor of natural history in Franklin College, and from 1856 to 1869 as professor of chemistry and geology in the University of South Carolina. In 1869 he was appointed to the chair of geology in the University of California, which office he retained until his death. Professor Le Conte did much to popularize the study of geology in America, and also contributed valuable descriptive and theoretical papers to geological literature. He was elected vice-president of the National Congress of Geologists in 1891, and in the following year president of the American Association for the Advancement of Science. The more important of his publications are: *Religion and Science* (1873); *Elements of Geology* (1878); *Compend of Geology* (1884); *Evolution: Its Nature, Its Evidences, and Its Relation to Religious Thought* (1887). Besides shorter papers contributed to geological journals, he wrote many essays on biology, philosophy, optics, and other subjects.

LE CONTE, LEWIS (1782-1838). An American naturalist, father of Joseph Le Conte. He was born near Shrewsbury, N. J., of Huguenot descent; graduated at Columbia in 1799; studied medicine with the celebrated Dr. David Hosack, and settled in Georgia, taking care of his father's estate and establishing a botanical garden, where he cultivated rare bulbous plants obtained from the Cape of Good Hope. He devoted considerable time to mathematics and zoölogy, as well as botany. His manuscripts were lost at the burning of Columbia, S. C., in 1865.

LECONTE DE LISLE, le-kônt' de lēl, CHARLES MARIE (1818-94). The greatest French poet of the modern Parnassian School, born at Saint Paul, on the Ile de Bourbon, now Réunion, October 23, 1818. His youth in the tropics fostered his inborn love for the beauty of nature, but his restless imagination urged him to travel. Declining to follow his father's occupation as a planter, he went to France, studied law at Rennes, traveled widely, and at thirty settled in Paris. He presently sacrificed his paternal allowance by supporting a servile insurrection in Réunion. The only milestones in his uneventful life were the honors that slowly came to him, a post in the Luxembourg Library (1873), officer's rank in the Legion of Honor, election to the Academy (1887). He became the centre of a school of young poets who recognized in the genial friend the master's authority. His first noteworthy volume, which waited several years for a publisher, was *Poèmes antiques* (1852), followed in 1854 by *Poèmes et poésies*, and in 1862 by *Poèmes barbares*, which won an academic prize of 10,000 francs, and by *Poèmes tragiques* in 1884. A posthumously published volume of *Derniers poèmes* (1895) contains several interesting critical essays on Leconte de Lisle's lyric forerunners. He was also the moving spirit of a series of volumes, *Le parnasse contemporain* (1866, 1869, 1876), in which the poets of his school practiced the refinements of their art. Here some of his own most remarkable poems first appeared. Leconte de Lisle contributed also to literature the first fairly accurate translations in French of the *Iliad* (1867), the *Orphic Hymns* (1869), Hesiod (1869), the *Odyssey* (1870), Horace (1873), Sophocles (1877), and Euripides (1885). He wrote also two dramas in imitation of the Greek, *Les Erinnyes* (1872) and *L'Apollonide*, based on the *Ion* of Euripides. The earlier of these translations won Leconte de Lisle a small pension from the Empire, and from these classical studies he drew the marrow of his exquisite culture, the pagan element in which appears least attractively in an *Histoire du christianisme* and a *Catéchisme républicain*, both published anonymously. The poems are objective in tone and scholarly in purpose, seeking, as he said, to unite, if not to mingle, art and science. His aim through all his original verse is to show the gradual unfolding of the ideal life and the reachings of religious thought into the legendary past and the hidden future of the race. He is the most stately, brilliant, self-possessed of French poets, with perfect control of all the processes of his art; but ethically a poet of protest and disillusionment, pessimistic, skeptical. He died at Louveciennes, July 17, 1894.

For criticism of Leconte de Lisle, consult: Brunetière, *Nouveaux essais sur la littérature contemporaine* (Paris, 1895); Bourget, *Nouveaux essais de psychologie contemporaine* (ib., 1887) Lemaître, *Contemporains* (vol. ii., 12th ed., ib., 1890); and Pellissier, *Mouvement littéraire* (trans., New York, 1898). Biographical reminiscences are in *Revue des Deux Mondes*, May, 1895, and *Revue Bleue*, June, 1895.

LECOUVREUR, le-kōō'vrẽr', ADRIENNE (1692-1730). A French actress, celebrated alike for her brilliant dramatic gifts and the tragic ending of her life of pleasure. She was born near Epernay, April 5, 1692. Her father, a hatter, went to Paris to better his trade. Near the theatre of the Comédie Française, Adrienne, then a grown girl, and a laundress, organized, among the neighbors, a little private theatre, which was so successful as to draw from the comedians of the Royal Theatre a complaint against it as an unauthorized rival. The amateur performances thus closed, Adrienne was taken by a kind prior to the actor Legrand, who was struck with her talent and beauty, and gave her lessons in elocution. She played at Lille, Strassburg, and elsewhere, and after some years of provincial successes was called in 1717 to the Comédie Française. She at once won the first place among French actresses. Her force of character, high spirit, and noble beauty gave all her impersonations the stamp of her individuality. Her favorite rôles were those of exalted passion, like Pauline, Monime, Bérénice, Athalie, and Phèdre. She delighted Paris, and for thirteen years her real life, like her acting, was a stormy elysium, filled with the loves and gallantries of the most eminent men of her time. She died in Paris, March 20, 1730, poisoned, it is said, by means of a bouquet of flowers sent by the Duchess de Bouillon, a rival mistress of Maurice of Saxony. Her story is the subject of a well-known drama by Scribe and Legouvé, which was first acted at the Théâtre Français by Rachel in 1849.

LECOY DE LA MARCHE, le-kwä′ de lȧ märsh, ALBERT (1839-97). A French antiquary and historian. He was born at Nemours and educated at the Ecole des Chartes (1858-61). From 1861 to 1864 he was keeper of the departmental archives of Haute-Savoie, and in the latter year became connected with the archives at Paris. There he was professor of history at the Catholic Institute (1877-80), and in 1884 founded classes for the higher education of women, which were held at the Salle Albert le Grand and later at the rooms of the Geographical Society. His writings, which have a certain value, as they are all founded on manuscripts usually contemporary with the period treated, include: *De l'autorité de Grégoire de Tours* (1861); *Notice historique sur Ripaille en Chablais* (1863); *La chaire française au moyen âge* (last edition 1886); *La société au XIIIe siècle* (1880); *La guerre aux erreurs historiques* (1888); and *Relations politiques de la France avec le royaume de Majorque* (1892).

LE CREUSOT, le krē′zō′. A town of France. See CREUSOT, LE.

LECTERN (also *lettern, lettron*, from OF. *lettrin, lettron, leutrin*, Fr. *lutrin*, from ML. *lectrinum, lectrum*, reading-desk, from Gk. *λέκτρον, lektron*, couch). A reading-desk or stand, movable or stationary, from which the Scripture lessons (*lectiones*), which form a part of the various Church services, are chanted or read. The term is properly applied only to the class mentioned as independent of the pulpit. Such lecterns were either fixed or movable; when fixed they were sealed to the pavement in the centre of the choir and were made of wood or metal—ordinarily brass or latten. The light, movable lecterns, usually of iron or wood, are less decorative. The lectern is of very ancient use, from the early Christian period to the present in the different Christian denominations, especially the Catholic and Episcopal. It is made of very various materials—gold, silver, bronze, brass, marble (plain or inlaid), or wood. It either had an independent base or stand, or else was part of the pulpit (q.v.), or ambone. None of the lecterns in precious metal have been preserved, but descriptions of such stands, in the *Liber Pontificalis*, shows them to have been in early use, and to have been flanked with candelabra. The earliest preserved are the stationary marble lecterns on pulpits in Italy, as on those of San Lorenzo and the Aracœli in Rome. Richer are the lecterns on pulpits of the Pisan Tuscan school of the twelfth, thirteenth, and fourteenth centuries, especially those carved by the Pisan sculptors Niccola and Giovanni. In these examples an eagle with outspread wings supported the booklike slab, and it rested upon a composite group of the three other living creatures, symbols of the Evangelists, the Angel, the Lion, and the Ox. Usually only the eagle was carved under the book, and this became the normal type of lectern preserved to the present time. So usual was it to make the eagle the central ornament that the mediæval name for this choir lectern was ordinarily *aquila;* but sometimes the pelican was substituted (wooden lectern of fifteenth century at Zammel). This was often the case in the fifteenth and sixteenth centuries with the weakening of the old religious traditions, when other figures were substituted, such as griffins, angels, or men, contrary to true iconography. Sometimes, as in the case of the iron lectern at Tournai Cathedral, there is no figured decoration. During the Gothic and Renaissance periods the churches of Central and Northern Europe were decorated with beautifully carved lecterns, and even in Italy there were many inlaid with *intarsia*, or carved, in connection with the choir-stalls, like that of Verona (Santa Maria in Organo).

LECTIONARY (ML. *lectionarium, lectionarius*, book of lessons, from Lat. *lectio*, lesson, reading, from *legere*, to read, Gk. *λέγειν, legein*, to say). One of the service books of the mediæval Church containing the portions of Scripture to be read in public worship. There are two lectionaries which deserve special notice. The first is the so-called 'Roman lectionary,' which contained the epistles and gospels of the Roman missal, and sometimes all the lessons of all the various services in use in the Roman Church, in which case it was named the *plenarium*. The most ancient form of the Roman lectionary was called *comes* or *liber comitis*. Its compilation was attributed to Saint Jerome, and it appears certain that it belongs in substance, although not in form or in details, to his age. The collection was revised and remodeled in the eighth century. The second of the ancient lectionaries is that known as the 'Gallican lectionary,' which was published by Mabillon from a MS. of the monastery of Luxeuil, and which is believed to represent the rite of the ancient Gallican Church. It is, however, imperfect, and no other copy has since been discovered.

LEC′TISTER′NIUM (Lat., a couch-spreading, from *lectus*, couch + *sternere*, to spread). A sacrificial ceremony among the ancient Romans; it had its analogue among the Greeks (*κλίνην στρῶσαι*), on occasions of extraordinary solemnity, when figures of the greater deities were placed reclining or seated on the sacred *pulviner* in the street shrines, and a feast was spread on tables before them. Such a ceremony was first ordained by the Sibylline Books on the occasion of a pestilence in B.C. 399. Generally, the gods were placed on the couches in pairs, as Apollo and his mother Latona, Diana and Hercules, Mercury and Neptune. The ceremony was earlier resorted to in times of trouble, with the idea of appeasing the angry deities, but later also (and particularly) on occasions of general exultation, as a part of the *supplicatio*, or thanksgiving. Sometimes it was customary to represent the female deities seated, when the ceremony was technically called ***sellisternium***.

The images were generally of wood, with heads of clay, wax, or marble.

LE'DA (Lat., from Gk. Λήδα). In Grecian legend, the wife of the Spartan King Tyndareus, whom Zeus visited in the disguise of a swan. She became the mother by Zeus of Pollux and Helen, and by Tyndareus of Castor and Clytemnestra. In Homer only Helen is the child of Zeus. Others made Helen the daughter of Nemesis, and merely a foster-child of Leda. Leda with the swan was a favorite theme in ancient art, and has been treated by many modern artists.

LEDEBOUR, lā'de-bo͞or, Karl Friedrich von (1785-1851). A German botanist, born at Stralsund. At the age of twenty he became director of the botanical garden and professor of botany at Greifswald, which positions he held until 1811, when he went to Dorpat. He remained there until 1836, and from then until his death resided mainly in Germany. His most important writings are: *Reise durch das Altaigebirge* (2 vols. 1829-30); *Icones Plantarum Novarum Floram Rossicam* (5 vols., 1829-34); *Flora Rossica* (3 vols., 1842-51).

LEDEBUR, lā'de-bo͞or, Leopold, Baron (1799-1877). A German historian, born in Berlin. In the new Berlin Museum he was appointed director of the art department of the Museum for German Antiquities and of the ethnographical collection and served there until 1875. His more important books include: *Das Land und Volk der Brukterer* (1827); *Blicke auf die Litteratur des letzten Jahrzehnts zur Kenntnis Germaniens zwischen Rhein und Weser* (1837); and in genealogy and heraldry the *Archiv für deutsche Adelsgeschichte, Genealogie, Heraldik und Sphragistik* (1863-65).

LEDERER, lā'de-rĕr, John. A German explorer in America. He wrote in Latin a book of his adventures which was translated by Sir William Talbot under the title *The Discoveries of John Lederer in Three Several Marches from Virginia to the West of Carolina and Other Parts of the Continent: Begun in March, 1669, and Ended in September, 1670. Together with a General Map of the Whole Territory which he Traversed* (1672). In his preface, the translator says that he met Lederer in Maryland, whither the latter had been forced to flee by the jealous rage of the Virginians.

LEDESMA BUITRAGO, lā-dĕs'mȧ bwā-trä'gō, Alonzo de (1552-1632). A Spanish poet, born at Segovia. He first became known as the author of the *Conceptos espirituales* (1600) and *Juegos de nochebuena* (1611). These volumes established the cult of the *conceptistas*. It was a school of impossible conceits and paradoxes, and in order to make the whole scheme mystical, a curious vocabulary became part of the system. Other works are *Monstruo imaginado* (1615) and *Epigramas y jeroglificos á la vida de Christo . . .* (1635). Quevedo was the most celebrated disciple of this school, and its influence extended to Lope de Vega. Rivadeneira's *Biblioteca de autores españoles* (Madrid, 1872) contains a selection of the works of Ledesma.

LEDOCHOWSKI, lĕ'dō-kŏv'skē, Mieczyslaw, Count (1822-1902). A Roman Catholic ecclesiastic. He was born at Gorki, near Sandomir, in Galicia, of an ancient Polish family, educated by the Lazarists at Warsaw and the Jesuits in Rome, and ordained priest in 1845. He soon attracted the favorable notice of Pius IX., who made him a domestic prelate and prothonotary apostolic. After filling various diplomatic posts at Madrid, Lisbon, Rio de Janeiro, Santiago, and Brussels, he was raised to the episcopate in 1861 as titular Archbishop of Thebes. On the nomination of the Prussian Government, he was appointed in 1866 to the metropolitan see of Posen and Gnesen; but, dissatisfied with the attitude of the Government in 1870, when his request for German intervention in favor of the Pope was disregarded, he took the lead in the ultramontane opposition, and did much to encourage the Polish national movement. In 1873 the determined stand which he took against the 'May Laws' in the Kulturkampf (q.v.) caused him to be imprisoned for two years at Ostrowo. At the beginning of his captivity the Government deprived him of his see; the Pope, however, made him a cardinal in 1875, and after his release he resided in Rome, formally resigning his archbishopric in 1886. From 1892 until the time of his death he occupied the important position of Prefect of the Propaganda. See Missions, Christian.

LEDRAIN, le-drăN', Eugène (1844—). A French archæologist, born at Sainte Suzanne (Mayenne). He was at first a priest, but afterwards devoted himself especially to the study of Oriental archæology. He became one of the curators of the Department of Oriental Antiquities in the Louvre, and professor at the school attached to that museum. His works include: *Un grand seigneur féodal dans la moyenne Egypte* (1876); *Les momies gréco-égyptiennes ornées de portraits peints sur panneaux* (1877); *Histoire d'Israël* (1879-82); and *Les monuments égyptiens de la Bibliothèque Nationale* (1880-81).

LEDRU-ROLLIN, le-drụ'rō'lăN', Alexandre Auguste (1807-74). A noted French radical. He was born February 2, 1807, at Fontenay, near Paris, in a house which had once been Scarron's. He studied for the bar, and was admitted in 1830. He was counsel for the defense in most of the prosecutions of opposition journals during the reign of Louis Philippe, and obtained a great reputation as a defender of republicans. In 1841 he was elected Deputy by the Department of Sarthe, and became prominent in the Chamber as a member of the extreme Left. He was the editor of several of the most advanced newspapers of the day, and the author of pamphlets and protests against the repression of public and individual liberties. In 1846 he published an *Appel aux travailleurs*, in which he declared his attitude toward the working classes. He was also an ardent promoter of the reform meetings that preceded the Revolution of 1848, being associated with Lamartine and Louis Blanc as an orator of the workingmen, at whose political banquets he advocated the *droit pour travailler* ('right to labor') and universal suffrage. On the outbreak of the Revolution he became one of the leaders and advocated the formation of a provisional government, and when this was carried out was intrusted with the portfolio of the Interior. He was afterwards one of the five in whose hands the Constituent

Assembly placed the interim government (May 10, 1848). In this position he showed a certain want of perception, firmness, and energy. In June, 1848, he ceased to hold office, and thenceforth sought to recover his influence with the extreme democrats, which he had partly lost by accepting office. He succeeded partially and ventured on a candidature for the Presidency, obtaining, however, only 370,000 votes (December, 1848). In May, 1849, he was chosen to the Legislative Assembly, but the unsuccessful protest of June 13th against Louis Napoleon's Government put an end to his political career. He fled to England and became later on associated in London with Mazzini, Kossuth, and other European revolutionists in the issuing of republican manifestoes. While there he wrote and published a work against the land which had given him an asylum, *La décadence de l'Angleterre* (1850). For the next twenty years he lived alternately in London and Brussels. His name was excepted from the amnesties of 1860 and 1869; but in 1870 he was allowed to return to France. In February, 1871, he was returned to the National Assembly, but at once resigned, though later (1874) he sat as a member of the extreme Left in the Versailles Assembly, where he made his last great oration in favor of universal suffrage, June 3, 1874. He died December 31, 1874. His *Discours politiques et écrits divers* were published by his widow (2 vols., Paris, 1879).

LEDUM (Neo-Lat., from Gk. λῆδον, *lēdon*, from Ar. *lădan*, *ladanum*). A genus of plants of the natural order Ericaceæ, which consists of small evergreen shrubs, with comparatively large flowers, of which the corolla is cut into five deep petal-like segments. The species are natives of Europe and North America, some of them common in both. The leaves of *Ledum latifolium* are said to be used in Labrador as a substitute for tea, whence it is sometimes called 'Labrador tea.' Sir John Franklin and his party, in the Arctic expedition of 1819-22, used *Ledum palustre* in the same way to produce a beverage with a smell resembling rhubarb. They found it refreshing. The leaves of both these shrubs possess narcotic properties, and have been used as a substitute for hops in beer. They are regarded as useful in agues, dysentery, and diarrhœa, since they contain tannin. They are also used in the preparation of certain kinds of leather, as Russia leather.

LEDYARD, John (1751-88). An American traveler, born at Groton, Conn. His father dying early, Ledyard was brought up by his paternal grandfather at Hartford. At first he studied law, but in 1772 entered Dartmouth to fit himself for a missionary career. Soon absenting himself, he spent several months with the Iroquois, and in 1773 went as a common sailor to Gibraltar, where he enlisted in a British regiment, from which, however, he was almost immediately discharged. He returned to America, but in 1776 went to England, and, as a corporal of marines, accompanied Captain Cook on his last voyage (1776-79). In 1782, while on a man-of-war off Long Island, he deserted; but in June, 1784, returned to England, where and in Paris he made fruitless efforts to organize an exploring expedition to the northwest coast of North America. He then, with the assistance of Sir Joseph Banks, undertook a tour of exploration in the extreme north of Europe. Starting from Stockholm on foot (December, 1786), he traversed the coast-line of the Gulf of Bothnia, and arrived at Saint Petersburg early in 1787. At Irkutsk he was arrested by order of the Russian Government, and was subsequently expelled from the country with orders not to return. He reached London with the greatest difficulty; but almost immediately—on behalf of the African Association—started on an expedition to the interior of Africa. At Cairo, however, he became ill, and died (probably in November, 1788), from the effects of an overdose of 'vitriol.' A journal which he kept during Captain Cook's voyage had been confiscated by the British Government, but in 1782 he published an account from memory which became very popular. Some of his papers were also published after his death by the African Association. Consult his "Life" (Boston, 1828), by Jared Sparks, in Sparks's *American Biography*, vol. xxiv.

LEDYARD, William (c.1740-81). An American soldier, born at Groton, Conn. He was one of the Committee of Correspondence chosen at Groton on the closing of the port of Boston by Parliament, and in 1776 was appointed by the Connecticut Assembly, of which he was a member, to be captain of an artillery company, which it was proposed to raise for the purpose of garrisoning the forts at New London. In March, 1778, he was promoted to be major, and was appointed to command the posts at New London, Stonington, and Groton. On September 6, 1781, a large British force under Benedict Arnold landed at the mouth of the Thames and advanced against New London. Ledyard was summoned to surrender, but though he had only some 150 ill-armed militia with him in Fort Griswold, refused, hoping to be able to withstand the British until the countryside could arm. After an obstinate resistance the fort was taken by storm, and Colonel Ledyard surrendered. Major Bromfield, to whom he gave up his sword, plunged it into his breast, and then the soldiers, imitating their commander's example, murdered the greater number of their defenseless captives. Arnold in his report makes no mention of this massacre.

LEE. A town, including the villages of South Lee and East Lee, in Berkshire County, Mass., 12 miles south of Pittsfield, on the Housatonic River, and on the New York, New Haven and Hartford Railroad (Map: Massachusetts, A 3). It is in a region noted for its grand scenery and popular as a place of summer resort. The town has a public library. There are extensive quarries of fine white marble, which has been used in the construction of many prominent buildings. Marble-quarrying and the manufacture of paper are the principal industries. The government is administered by town meetings. Settled in 1760, Lee was incorporated in 1777, and was named in honor of Gen. Charles Lee (q.v.). Population, in 1890, 3785; in 1900, 3596. Consult: Hyde and Hyde, *Centennial History of Lee* (Lee, 1878), and *Records of the Town of Lee* (Lee, 1900).

LEE (AS. *hlēo*, shelter, Icel. *hlē*, Dan. *læ*, lee). The quarter or direction *toward* which the wind blows, and the opposite direction from *weather*, which is the point or quarter *from* which it blows. To get *under the lee of* an object means to have that object between you and the wind, so as to get less wind or a smoother sea. *To leeward* is toward the *lee*, away from the direction from which the wind comes. The *lee-anchor* (in the case of a ship moored with two anchors) is the one by which she is not riding. A *lee-board* is a small board placed on the lee side of a small boat to keep her from drifting to leeward; it was the prototype of the centre-board so much used in shallow-built vessels.

LEE, Alfred (1807-87). An American bishop of the Protestant Episcopal Church. He was born at Cambridge, Mass., graduated at Harvard in 1827, and, after legal studies and three years' practice of the law in New London, Conn., graduated at the General Theological Seminary in 1837. He was rector of Calvary Church, Rockdale, Pa., from 1838 to 1841, when he was chosen first Bishop of Delaware, becoming rector of Saint Andrew's, Wilmington (1842). He was a member of the American Committee for the Revision of the New Testament (1881), and presiding bishop (1884). Lee wrote: *Life of Saint Peter* (1852); *Life of Saint John* (1854); *A Treatise on Baptism* (1854); *Memoir of Susan Allibone* (1856); *Harbinger of Christ* (1857); and *Coöperative Revision of the New Testament* (1881).

LEE, Ann (1736-84). The founder of the Shakers in America. She was born in Manchester, England, February 29, 1736. In 1758 she became connected with Quakers, or Shakers, a sect established by seceders from the Friends who, in their meetings, exhibited fits of trembling, whence their name. In 1762 she married Abraham Stanley (or Standerlin). She was at the time a cook, he a blacksmith, and both were unable to write. In 1770 she claimed to have a revelation that strict continence was enjoined. For preaching this doctrine and other peculiarities of the Shaking Quakers' faith, such as the nearness of the Second Advent, and for her alleged visions, prophecies, and power of working miracles, she was much persecuted and several times imprisoned; but, on the other hand, so endeared to her co-religionists that they yielded to her leadership and called her Mother Ann. To escape persecution, she came with her husband and some followers to America in 1774. In 1776, having separated herself entirely from her husband, she established at Niskayuna (now Watervliet), near Troy, N. Y., the first Shaker community. During the Revolutionary War she was imprisoned, with some of her followers, because they refused to bear arms. Released in 1781, she traveled on a missionary tour. She died at Watervliet, September 8, 1784. See Shakers.

LEE, Arthur (1740-92). One of the American representatives in Europe during the Revolutionary War, youngest son of Thomas Lee, and brother of Richard Henry Lee, Francis Lightfoot Lee. He was born in Stratford, Westmoreland County, Va., December 20, 1740, and was educated at home in Virginia, at Eton, and at the University of Edinburgh, where he received the degree of M.D. After travel on the Continent, he returned to Virginia, and began the practice of medicine at Williamsburg. Soon, however, abandoning this, he proceeded in 1766 to London, where he continued the study of law until 1770, and successfully practiced his profession there until 1776, taking an effective share in the political pamphleteering of the time. Upon Franklin's return to America early in 1775, Lee succeeded him as the agent of Massachusetts, and late in the same year he was appointed by the Committee of Secret Correspondence of the Continental Congress as its secret agent in London. In this capacity, also, he spent much of the following year at Paris, and in October, 1776, was appointed by the Continental Congress one of its commissioners to France. Early in 1777 he was sent as a commissioner of the United States to Spain, but was not received officially, and accomplished little, beyond securing a small loan. Upon his return from Spain he went informally, in the summer of 1777, to the courts of Austria and Prussia, for the purpose of securing aid or, at least, of establishing cordial relations. Meanwhile, until the appointment of Jay, he continued to act as Commissioner to Spain, though he did not revisit that country. He was also one of the negotiators of the treaties concluded with France in February, 1778. The importance of his services and the extent of his influence were greatly diminished by his bitter opposition to Franklin. Under rather inauspicious circumstances he returned to America in the summer of 1780, and retired temporarily to private life. In the spring of 1781 Prince William County sent him to the Virginia Legislature, by which body, at the close of the year, he was sent to the Continental Congress, where he remained until 1785. In 1784 he was one of the commissioners who negotiated the Treaty of Fort Stanwix (q.v.) with the Indians of the northern and northwestern frontiers. From 1784 to 1789 he was also a member of the 'Treasury Board,' and he was one of the commission created in 1786 to revise the laws of Virginia. On the establishment of the new National Government he retired finally to private life, and died after a brief illness, December 12, 1792. Consult: R. H. Lee, *Life of Arthur Lee, with His Political and Literary Correspondence* (2 vols., Boston, 1829); and Wharton (ed.), *Revolutionary Diplomatic Correspondence of the United States*, vol. i. (Washington, 1889). The Arthur Lee Manuscripts are to be found in the library of Harvard University.

LEE, Charles (1731-82). A British-American soldier, born at Dernhall, Cheshire, England. He received a commission as lieutenant in the British Army in 1751; accompanied Braddock's expedition in 1755; and in 1758 was wounded at Ticonderoga, and was promoted to a captaincy. In 1762 he served with conspicuous gallantry in Portugal, and received a commission from that country as a lieutenant-colonel under Burgoyne, who had been sent by England to assist Portugal against Spain. In 1764-66 and again in 1769-70 he served in the Polish Army, first as a staff officer under King Stanislas Augustus and later as a major-general in the Turkish campaign. After much intriguing he became a lieutenant-colonel on half pay in the British service in May, 1772, and in the fall of 1773 emigrated to America, where he used every effort to ingratiate himself with the Patriot party, whose side he took with great ostentation. Several political pamphlets which he wrote at this time became very popular. In 1775 he bought a farm in Berkeley County, Va. In the same year he was appointed by Congress to the second major-generalship in the Continental Army, and became senior major-general, next in rank to Washington, on the resignation of Gen. Artemas Ward. In 1776 he was placed in command of the Southern Department, and received most of the credit for the defense of Charleston, though he had opposed and ridiculed Moultrie's plans. In October he took command of the right wing of the American army near New York. Disregarding Washington's orders, he delayed his retreat into New Jersey for two weeks, and then proceeded with great deliberation. On December 13th, while at Basking Ridge, a few miles from his army at Morristown, he was captured by British dragoons, and was taken to New York. Here he betrayed the American plans to the British, but in May, 1778, his treason not being suspected by Washington, he was exchanged. For his conduct at the battle of Monmouth (q.v.) he was convicted by court-martial of disobedience, misbehavior before the enemy, and disrespect to the Commander-in-Chief, and was suspended from his command for a year. Soon afterwards he was wounded in a duel with Colonel John Laurens, one of Washington's aides, and, on addressing an impudent letter to Congress, was dismissed from the service. He retired to his farm, and in 1782, while on a visit to Philadelphia, he died. Consult: Moore, *The Treason of Charles Lee* (1858); and a chapter in Fiske, *Essays Historical and Literary* (New York, 1902).

LEE, Eliza (Buckminster) (1792-1864). An American author, the daughter of Joseph Buckminster. She was born at Portsmouth, N. H., was well educated by her father and brother, Joseph Stevens Buckminster; married a Thomas Lee of Boston; became a writer, and was unusually felicitous in her descriptions of New England life. She wrote: *Sketches of a New England Village* (1838); *Naomi, or Boston Two Hundred Years Ago* (1848); and memoirs of her father and brother (1849). She translated from the German, wrote a life of Richter (1842), and published an historical novel, *Parthenia, the Last Days of Paganism* (1858).

LEE, Fitzhugh (1835-1905). An American soldier, nephew of Robert E. Lee, and prominent as a Confederate officer during the Civil War. He was born in Clermont, Va.; graduated at West Point in 1856; served against the Indians; and from May, 1860, until the outbreak of the Civil War was instructor of cavalry at West Point. He resigned from the Federal service early in 1861, entered the Confederate Army, and until September of that year was adjutant-general in General Ewell's brigade. He then served as colonel of a cavalry regiment in nearly all the important operations of the Army of Northern Virginia; was appointed brigadier-general in July, 1862, and major-general in September, 1863; was severely wounded at Winchester, Va., on September 19, 1864; and from March, 1865, until his surrender to General Meade at Farmville, was in command of all the cavalry of the Army of Northern Virginia. In 1874 he delivered a patriotic address at Bunker Hill, which attracted considerable attention; in 1882-83 he made a lecturing tour through the South on behalf of the Southern Historical Society; and from 1886 to 1890 he was Governor of Virginia. He was appointed collector of internal revenue for the western district of Virginia in 1895, and in 1896 was sent to Cuba by President Cleveland as consul-general at Havana. In April, 1898, when war with Spain appeared inevitable, he was recalled, along with all the other American consuls, and in May was appointed major-general of volunteers and placed in command of the Seventh Army Corps. In January, 1899, he became Military Governor of Havana, and subsequently was placed in command of the Department of Missouri. He published *Robert E. Lee* (1894) in the "Great Commanders Series."

LEE, Francis Lightfoot (1734-97). An American patriot, and one of the signers of the Declaration of Independence. He was born at Stratford, Westmoreland County, Va., and was the fourth son of Thomas Lee, and the brother of Richard Henry Lee and Arthur Lee. He was educated by private tutors, and upon the death of his father he inherited a considerable fortune, and, establishing himself on his large estates on the banks of the Rappahannock, he lived there the quiet, easy life of a Virginia gentleman. He was a sincere patriot and was willing to risk all in the cause of the Colonies. He served for ten years (1765-75) in the Virginia House of Burgesses, and in 1775 was elected a member of the Continental Congress, in which he served until 1779, signing the Declaration of Independence in 1776 and taking part in the work of framing the Articles of Confederation. After his retirement from Congress his only participation in public affairs was a term in the Senate of his native State.

LEE, Frederick Richard (1799-1879). An English painter. He was born in Devonshire and began life as a soldier, but, owing to weak health, was compelled to leave the army. In 1818 he entered the schools of the Royal Academy, where he exhibited for the first time in 1824. He exhibited regularly until 1870, became an academician in 1838, and was placed upon the honorary retired list in 1872. Lee was essentially a painter of simple English landscape, his favorite subject being Devonshire. He occasionally introduced into his landscapes animals, which were painted by some fellow artist, usually by his friend Thomas Sidney Cooper. The National Gallery contains his "Cover Side" (1839), with animals by Landseer; "Showery Weather" (1874); "Evening in the Meadows" (1854); "River Scene," with animals by Cooper. He spent the last years of his life in travel, and died in Cape Colony, June 5, 1879.

LEE, Gerald Stanley (1861—). An American lecturer, critic, and author, born at Brockton, Mass. He graduated at Middlebury College (Middlebury, Va.) in 1885, at the Yale Divinity School in 1888, and became known as a lecturer on literature and the arts in modern times and a contributor to the *Critic* and other periodicals. His publications include: *About an Old New England Church* (1893); *The Shadow Christ* (1896), a study of the Hebrew poets; and *The Lost Art of Reading* (1902).

LEE, Harriet (1757-1851). An English author, born in London. With her sister Sophia she secured a competence by the successful management of a private school, and resided in the vicinity of Tintern Abbey, and afterwards at Clifton. Here she wrote, among other works, the novel *The Errors of Innocence* (5 vols., 1786), and a drama, *The New Peerage* (1787). She is best known, however, for her *Canterbury Tales* (5 vols., 1797-1805), which were republished in New York in 1857. In this work she was assisted by her sister Sophia; but of these tales, all except two were written by Harriet. Of these the best known is *Kruitzner*, which (1821) was dramatized by Byron, and published, with due acknowledgment, under the title of *Werner, or the Inheritance.*

LEE, Henry (1756-1818). An American soldier and statesman, a member of the famous Lee family of Virginia, born at Leesylvania, one of the family estates on the Potomac. He graduated at Princeton in 1774, and soon after the outbreak of the Revolutionary War obtained a captaincy in Col. Theodoric Bland's cavalry legion. In 1777 he joined Washington just before the battle of Brandywine, and from that time on for three years was employed in scouting and outpost duty, in which his restless activity earned him the nickname of 'Light Horse Harry.' He assisted General Wayne at the capture of Stony Point, and soon afterwards commanded an expedition of his own which surprised and captured the British post at Paulus Hook (see Jersey City), an exploit which won for him the thanks of Congress and the commendation of Washington. In 1780 his legion was sent to the Southern States to aid in retrieving the disaster at Camden, and during General Greene's skillful retreat through the Carolinas, formed the rear-guard of the American forces. After the tide had turned and Greene was once more advancing southward, the legion took an important part in the recovery of places held by the British and did brilliant service at Eutaw Springs (q.v.). Early in 1782 Lee resigned his commission because of ill health and retired to Virginia, where, after the conclusion of peace, he interested himself in politics. In 1786 he was elected a delegate to Congress and two years later representative of Westmoreland County in the Virginia convention which ratified the Federal Constitution. From 1789 until 1791 he was a member of the State Legislature and from 1792 till 1795 was Governor of Virginia. While he was still an incumbent of this latter office (1794), Washington appointed him to command the 15,000 troops whose mere presence quelled the Whisky Insurrection. Five years later he entered Congress, and there, after Washington's death, delivered the funeral oration which contains the familiar phrase, "First in war, first in peace, first in the hearts of his countrymen." In 1801 he retired to private life, to appear again on the stage of public affairs only for a brief moment in 1812, when, after the first disasters to the American arms in Canada, he accepted an appointment as major-general. But before he could enter upon his new military duties he was wounded while aiding a friend, Alexander Contee Hanson (q.v.), editor of the Baltimore *Federal Republican*, whose property was attached by a mob of political opponents. Lee never recovered from this injury, and died while on his return from a voyage to the West Indies, taken in the hope that a change of climate might prove beneficial. He wrote *Memoirs of the War in the Southern Department of the United States* (1812), a fair and impartial description of General Greene's campaigns in the South, to the new edition of which (1869) is prefixed a biography by his son, Robert E. Lee (q.v.).

LEE, Henry Washington (1815-74). An American Protestant Episcopal bishop. He was born at Hampden, Conn., and was educated at Cheshire Academy and at Trinity College, Hartford, where he graduated in 1835. He studied theology while teaching at Taunton, Mass., received deacon's orders in 1838, and was rector in Springfield, Mass., in 1840-43. In 1854, while in charge of Saint Luke's Church, Rochester, N. Y., he was appointed Bishop of Iowa, and as such was instrumental in founding Griswold College at Davenport. He wrote some devotional works and juveniles.

LEE, Jesse (1758-1816). An American Methodist missionary. He was born in Prince George's County, Va., joined the Methodist Church in 1773, and in 1783 was admitted to the conference as a preacher. In 1789 he visited New England and preached Methodism from the Connecticut River to the farthest settlement in Maine. He formed the first Methodist class in New England, at Stratfield, Conn., September 26, 1787, and the first in Boston, July 13, 1792; and for his pioneer work in New England was often called 'The Apostle of Methodism.' He was a friend and assistant of Francis Asbury. Lee was three times chosen chaplain of the National House of Representatives, and once of the Senate. He wrote a *History of Methodism in America* (1807) which has value for the early period. Consult L. M. Lee, *Life and Times of Jesse Lee* (Richmond, Va., 1848).

LEE, John Doyle (1812-77). A Mormon official, born at Kaskaskia, Ill. In 1837 he came under Mormon influence and moved to Daviess County, Mo., where he joined the Church. Afterwards he returned to Illinois on mission work and when Nauvoo became the centre of the activity of the sect, he acted as personal guard to Joseph Smith and afterwards to Brigham Young. He was among the first to go to Salt Lake, and built the town of Parowan, besides locating numerous other settlements. At various times he was captain of the militia, president of Harmony, probate judge of Iron County, and member of the Territorial Legislature. He was accused of having incited the massacre of the Arkansas emigrants at Mountain Meadows (q.v.) in 1857. On his first trial before the United States Court in 1875 the jury disagreed, but on the second trial in 1876 he was found guilty. He was shot on the scene of the outrage, March 23, 1877. After his second trial he declared that he had acted under instructions from Brigham Young and other high Mormon officials, who had made him the scapegoat. His counsel, W. W. Bishop, published his confessions under the title, *Mormonism Unveiled, Including the Remarkable Life and Confessions of the Late Mormon Bishop, John D. Lee, written by himself* (1891).

LEE, Luther (1800-89). An American Methodist preacher, born at Schoharie, N. Y. He became a preacher of the Methodist Episcopal Church in 1827; espoused the anti-slavery cause (1838), incurring thereby the active opposition of the leaders of the denomination; withdrew from the Methodist Church in 1843 on account of its attitude upon the slavery question, and organized a new sect called the 'Wesleyan Connection.' He was president of the first Wesleyan

Methodist General Conference in 1844; edited the *True Wesleyan*, the organ of the new denomination; became president of Michigan Union College at Leoni, Mich., in 1856; and in 1864 was made professor in Adrian College, Michigan. In 1867 he returned to the Methodist Episcopal Church. Among his writings are: *Universalism Examined and Refuted* (1836); *Slavery in the Light of the Bible* (1855); and *Elements of Theology* (1856).

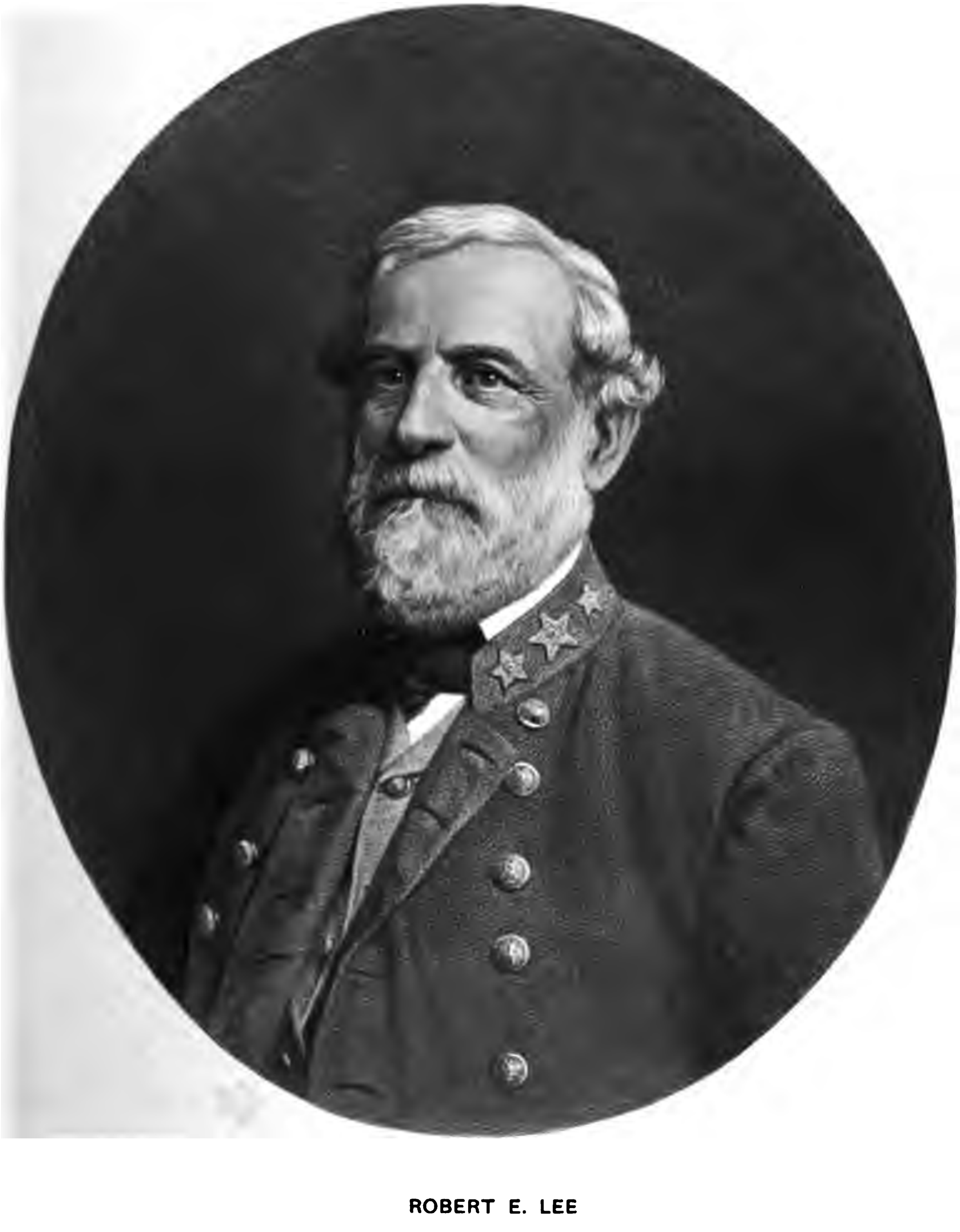
LEE, Nathaniel (c.1653-92). An English dramatic poet. He graduated at Trinity College, Cambridge, in 1668, and was then for a time an actor, but soon retired and devoted himself to the writing of tragedies. He first attracted attention in 1677, by his *Rival Queens*, in which occurred the well-known lines, "When Greeks join'd Greeks then was the tug of war." The work won high praise from Dryden, who was later associated with Lee in writing *The Duke of Guise* (1682). In 1684, however, Lee became insane, and he was confined in a lunatic asylum for four years. Upon his release he again devoted himself to literary work. Among the most popular of Lee's works, most of which treated subjects from classical history, are *Theodosius, Mithridates*, and *Lucius Junius Brutus*.

LEE, Richard Henry (1732-94). A patriot of the American Revolution. He was born at Stratford, Westmoreland County, Va., January 20, 1732, the son of Thomas Lee, who was president of the Virginia Council and a member of the Ohio Company. After receiving some preliminary education at home, the son was placed in school at Wakefield, England, where he remained until 1752, when he returned to Virginia and made his home with his elder brother. Taking an active interest in public affairs, Richard Henry Lee early became a justice of the peace for his native county, and was elected to the House of Burgesses of Virginia at a time when his brother Thomas was a member of the Legislative Council. In 1766, when the Legislature was taking action with reference to the 'Declaratory Act' of Parliament, he drafted the address to the King and also the memorial to the House of Lords. In 1773 he was appointed by the Legislature a member of the Virginia Committee of Correspondence, and in the following year was sent to the first Continental Congress. As a member of that body he drafted a number of important public papers, including the petition to the King, and as a member of the second Continental Congress he prepared the address to the inhabitants of Great Britain. He contributed largely to the more difficult work of that body, being recognized throughout as one of the really influential leaders of the revolutionary movement, and finally becoming famous by his motion of June 7, 1776 (adopted July 2d), that "these united Colonies are, and of right ought to be, free and independent States; and that all political connection between them and the State of Great Britain is, and ought to be, totally dissolved." With the decline of the prestige and power of Congress, Lee, as did other of the leading political workers, devoted more of his time to the affairs of his own State, serving in its Legislature from 1780 until 1784. He returned to Congress in the fall of 1784, and was then elected president of that body. In 1786 he was a member of the Virginia Legislature and in 1787 he was a member both of that body and of the National Congress. To the new Federal Constitution he was opposed, and after its adoption he was elected, by the Anti-Federalists, to the Senate, where he served until the condition of his health caused his resignation in 1792. At that time, however, he had become a supporter of Washington and of the new Constitution, but his resignation from the Senate was followed by his retirement from public life, and he died two years thereafter, June 19, 1794, at his home, Chantilly, in his native county of Westmoreland. Lee possessed great powers as an orator. His grandson, R. H. Lee, published *Life and Correspondence of Richard Henry Lee* (2 vols., Philadelphia, 1825).

LEE, Robert (1804-68). A Scotch clergyman. He was born at Tweedmouth, England, November 11, 1804; educated at the University of Saint Andrews; ordained a minister of the Scottish Church in 1832; settled at Arbroath in 1833, and at Campsie in 1836. When the Church of Scotland was divided by the secession, he remained with the Established Church, was called to the pastorate of the Old Grey Friars' Church in Edinburgh, and took a prominent part in the controversies that ensued. In 1846 he was appointed regius professor of biblical criticism in the University of Edinburgh, and in 1854 published the great work of his life, *The Holy Bible, with about 60,000 Marginal References and Various Readings, revised and improved.* In 1859 he was charged with introducing in public worship liturgical forms and postures unknown to the Church of Scotland; the fact being that he had published a volume of *Prayers for Public Worship* (1857) and used the same in his own church. He defended himself with such power and eloquence that his accusers were defeated. In 1864 he published *The Reform of the Church of Scotland in Worship, Government, and Doctrine.* He died at Torquay, England, March 14, 1868. Consult his *Life* by Story (Edinburgh, 1870).

LEE, Robert Edward (1807-70). A distinguished American soldier, commander-in-chief of the armies of the Confederate States of America. He was born in Westmoreland County, Va., January 19, 1807. His father was 'Light Horse Harry' Lee, a distinguished cavalry leader in the Revolutionary War; his mother, Anne Hall Carter. In 1811 his father removed to Alexandria, in Fairfax County. He entered West Point in 1825, on an appointment secured for him by Gen. Andrew Jackson, and by his diligence and ability graduated in 1829 second in his class. From this time until 1834 he was in the Engineer Corps, with the rank of second lieutenant. In 1831 he married Mary Randolph Custis, the granddaughter of Martha Washington. In 1834 he became assistant to the chief engineer of the army in Washington; three years later he superintended improvements at Saint Louis, and in 1842 he took charge of the defenses in New York Harbor, where he remained until the outbreak of the Mexican War, in 1846. In 1838 he had been made a captain.

In the Mexican War he was first with General Wool, for whom he did excellent scouting. Transferred at the personal request of General Scott to the army before Vera Cruz, he arranged the batteries so that the town was reduced in a week. After each of the battles of Cerro Gordo, Churubusco, and Chapultepec, he received pro



ROBERT E. LEE

motion, and for his services in the last was brevetted colonel. He was engaged in engineering work in the City of Mexico, and after the war was put in charge of the defenses then being constructed at Baltimore. In 1852 Lee became superintendent at West Point, and in his three years of service there improved the discipline greatly and lengthened the course of study to five years. On the formation of a new cavalry regiment in 1855, he was appointed lieutenant-colonel and saw service in western Texas against the Indians. In July the command of the regiment devolved on him, but three months later he was called home by the death of his father-in-law, Mr. Custis. Returning to his command, he continued with it until the fall of 1859, when he obtained leave to visit his family. During this visit he commanded the troops which suppressed the John Brown raid. He was then called to Richmond to advise the Legislature with regard to defense, should an invasion again occur. Returning to Texas, he was in charge of his former department, until, on the secession of that State in 1861, he was recalled to Washington.

Lee was earnestly opposed to disunion, but his future actions were clearly foreshadowed in a letter to his son: "Still, a union that can only be maintained by swords and bayonets, and in which strife and civil war are to take the place of brotherly love and kindness, has no charm for me. I shall mourn for my country and for the welfare of mankind. If the Union is dissolved and the Government disrupted, I shall return to my native State and share the miseries of my people, and, save in defense, will draw my sword on none." While deploring the actions of his people, he believed that they had been wronged, and his sympathy drew him to them. In the last analysis, too, he was a States-rights man; for he "would defend any State if her rights were invaded." He reached home on March 1, 1861, and on April 18th Frank P. Blair, on behalf of President Lincoln, visited him and offered him the command of the Army of the United States. Lee wrote later, "I declined the offer he made me to take command of the army that was to be brought into the field, stating, as candidly and courageously as I could, that, though opposed to secession and deprecating war, I could take no part in an invasion of the Southern States." On April 19th President Lincoln declared a blockade of the Southern ports; troops began to pour into Washington; the invasion of his State had, in Lee's opinion, begun, and on April 20th he resigned, three days later taking command in Richmond of the military forces of Virginia. On May 25th he ceased to be a major-general in the army of his State, and became a brigadier in the service of the South, no higher rank having then been created by the Confederate Government.

Lee found Virginia totally unprepared for the conflict, but acting as the commander-in-chief of the State troops and working steadily with General Gorgas, the chief of ordnance, he had by the end of May 30,000 men equipped and in the field and many regiments well advanced in organization. On June 8th President Davis took charge of all military movements and General Lee, though anxious to take the field, remained at his side as an adviser.

His first operations in the field were in West Virginia during the summer and autumn of 1861, and were on the whole unsuccessful. The disadvantages he had to contend with were great, his subordinates were at loggerheads, and the enemy under General McClellan was strong and alert. Assigned to the Department of South Carolina, Georgia, and Florida, he devoted himself to the task of creating coast defenses and interior works to protect the country on which the Confederacy was absolutely dependent for supplies. His grasp of the situation was masterly, and his personal presence did much to stimulate the rapidity with which the defense was made efficient. In March, 1862, he was recalled to Richmond to direct the military operations of the Confederacy, under the supervision of President Davis, and it speaks well for the serenity of Lee's character that this somewhat trying situation produced so little friction. Men and supplies had to be prepared to meet McClellan's advance up the Peninsula, where some victory was expected from the victors of the first Bull Run to compensate for the disasters of Forts Henry and Donelson, and of Roanoke Island. Lee kept in full communication with Jackson's movements in the Valley of Virginia, giving him free hand. When Gen. Joseph E. Johnston, who had command in the Peninsula against McClellan, wished to draw strongly on the defensive forces of the interior and to risk all on one battle, Lee, believing that a smaller army could be successful, opposed him, and was supported in this opinion by President Davis. Johnston steadily retreated before McClellan until Jackson's famous dash prevented McDowell, with his force of about 40,000, from joining the main Federal army; then he turned and fought the indecisive battle of Seven Pines (May 31-June 1). Lee took no part in this fighting, but on June 3 he took command, for Johnston had been wounded and the next in rank, Gen. G. W. Smith, was in bad health. Setting about vigorously to secure reënforcements and sending Stuart on his brilliant circuit of the Federal army, the new commander resisted the general desire for him to fall back on Richmond, and took the offensive. Some tremendous fighting at the battle of Gaines's Mill forced McClellan to retreat toward his gunboats on the James. The fierce fight of Malvern Hill, where the Confederates were unable to dislodge the Federals, allowed McClellan to reach his place of safety. The Federals had been driven back but not routed in these terrible seven days' battles around Richmond, June 25-July 1, and Lee was not satisfied with what he had done. It is possible that if he had had the right support from his subordinates he would have carried out his original plan of destroying the opposing army. General Pope soon after this took command of the Federal armies in Virginia west of Washington, while General McClellan retained position on the James River. Lee, assuming that Richmond was no longer in serious danger from McClellan's forces, planned to throw his whole available strength against Pope. A series of rapid and unexpected blows fell upon the outer armies under Pope's command, his store of provisions was captured, and on August 29 and 30, 1862, Pope's main army was signally defeated by Jackson and Lee on the same field that had witnessed the first battle of Bull Run. Lee then projected the invasion of Maryland, as well for political as for military reasons. On September 7th his entire army was near Frederick City.

The invasion was a tentative one, and was attended with many disheartening circumstances. Thousands of stragglers left the ranks between Manassas and the Potomac, the greater part weakened by want of rest. food, and shoes, and worn out by continued marches and daily battles, while many yielded to other motives. General McClellan had meanwhile been sent against Lee. On September 15, 1862, Harper's Ferry was captured by the Confederates under Jackson preparatory to the invasion of Pennsylvania. McClellan followed Lee's movements, keeping the body of his army between Lee and Washington. By good fortune, coming into possession of Lee's order of march, he forced the latter to turn. The battle of Antietam (q.v.), September 16th-17th, was the result, the advantage being with the Federals. With a greatly superior force, McClellan succeeded in compelling Lee to abandon his plan of invading Pennsylvania, but the latter's superior generalship displayed throughout the whole engagement and the subsequent movements prevented the former from obtaining any further advantages as Lee retreated southward. Lee and his army had fought with splendid skill and bravery, but the campaign as a political move was a failure. The Federal Government now decided to renew the attempt on Richmond, this time via Fredericksburg. On November 7th Burnside received the command of the Army of the Potomac. Both armies were rapidly drawn southward, and on November 20th Lee was gathering his entire army behind the works of Fredericksburg, while Burnside's covered the hills on the north facing them. On December 13th a determined assault was directed by Burnside squarely against the fortified hills of Fredericksburg. It was repelled with terrible loss to the Federal army. (See FREDERICKSBURG.) After this battle the army of General Lee was not again molested until the campaign of 1863 opened. Gen. Joseph Hooker had been appointed to supersede General Burnside, and with a powerful army, about double that of Lee, now declared his intention of forcing the Confederate army from Fredericksburg. At the end of April he led the bulk of his army across the Rappahannock, and took up a position near Chancellorsville. The genius of Lee was never more conspicuous than in the battle which followed (May 2d-4th), resulting in the complete defeat of Hooker. (See CHANCELLORSVILLE, BATTLE OF.) But while the battle of Chancellorsville had been brilliantly won, Lee had lost his greatest support, 'Stonewall' Jackson. After some indecisive fighting the Federal army on May 6th withdrew across the Rappahannock.

Lee now organized his army for the invasion of Pennsylvania, and on June 3d commenced the advance with 80,000 men. The entire Confederate army was transferred to North Virginia, and on June 27th it was concentrated near Chambersburg, Pa. Gen. George G. Meade succeeded Hooker in the command of the Federal army, which was now concentrated toward Gettysburg. General Stuart, on whom Lee depended for his information as to Federal movements, had unskillfully got on the other side of Meade and could render no service. On July 1st the battle of Gettysburg began by an unexpected collision between the Federal cavalry and the head of General Hill's column moving from Chambersburg toward Gettysburg. It resulted in the repulse of the Federal advance and its retirement to the strong position of Cemetery Ridge, south of Gettysburg. On July 2d, at 4 P.M., after a tremendous cannonade, the Confederates delivered an impetuous attack on the right side of Meade's position. It met with only partial success. On the afternoon of the 3d Lee ordered a cannonade which lasted for two hours, and under cover of which his attacking columns of 15,000 men formed. The attack was all that human bravery could make it; but the columns melted before the fire that waited for them; and though their van reached and covered the key of the struggle, their main force was annihilated, and the position quickly retaken. General Lee's equanimity was conspicuous in this defeat in the manner of his meeting the disorganized remnant of that returning column, infusing them with his own serene confidence and taking upon himself the responsibility for the fatal charge. Meade's army was seemingly too much shattered for him to venture the offensive the next day, although Lee stood ready for him. The Confederate general, now short of ammunition and fearing for his communications, began to retreat. (See GETTYSBURG, BATTLE OF.) Meade followed to the Potomac, but did not attack, and Lee got his army across with masterly skill. The Federal commander crossed into Virginia shortly afterwards, but no events of importance took place in that State during the remainder of the year. Lee, feeling that a crisis was at hand, suggested that he be relieved by a younger man, but President Davis promptly answered that such a step was impossible. The autumn of 1863 saw only manœuvring on the part of Lee and Meade, but the latter was forced to withdraw just when he was intending to attack, and Lee went into winter quarters behind the Rapidan.

After this winter of 1863-64, in which the privations that the Confederates suffered were well compared with those of the camp at Valley Forge, the final campaign opened with General Grant in command of the Federal forces. He recognized that the way to defeat Lee was to 'hammer' him out. Lee had only about 60,000 against Grant's 120,000, but he was fighting on the defensive in a very difficult country. From May 5th to June 12th there was terrible and almost continuous fighting in the 'Wilderness' (q.v.), and along the line of Grant's movement to the James River, Lee using his veterans with consummate skill, and Grant his constantly filled ranks with a persistence that was peculiarly his own. In this short time the Federals lost 60,000 men and the Confederates 14,000, and in the siege of Petersburg from June, 1864, to the beginning of April, 1865, the fighting was almost as terrible, save for the fact that now the Federals were defended by their works and the Confederates were almost without food. On April 2, 1865, Lee's position became untenable, and he resolved to try to lead the 30,000 men left to him southward. He abandoned Richmond and Petersburg, which were occupied by the Federals on April 3d; and Lee, pressing on to Amelia Court House, found that by some mistake his provisions had been sent on to the capital, and that he could neither fight nor retreat with any prospect of success. On April 9, 1865, he surrendered to General Grant at Appomattox Court House. The devotion of Lee's soldiers to their leader was never more strikingly shown than at the surrender.

Lee remained in Richmond until June, 1865, when he retired to a quiet country place. In October of the same year he was installed as president of Washington College at Lexington, Va., now Washington and Lee University. The five years of his service were marked by steady recuperation from the utter desolation of the war. New chairs were founded, the scheme of study was enlarged, and from the moral side it would have been impossible to secure finer results. In 1870 his health began to fail and a visit to the farther South was tried with only temporary results. On the morning of October 12th he died. Lee ranks as the greatest of the Southern commanders, his humane conduct throughout the war and the magnanimous way in which he stood defeat and urged the Southern people loyally to accept the result having contributed greatly to his fame. Consult: Cooke, *The Life of Robert E. Lee* (New York, 1871); Long, *Memoirs of Robert E. Lee* (New York, 1886); Fitzhugh Lee, *Robert E. Lee* (New York, 1894), in the "Great Commanders Series;" White, *Robert E. Lee* (New York, 1897), in the "Heroes of the Nations Series;" and a sketch by Trent, *Robert E. Lee* (Boston, 1899), one of the "Beacon Biographies."

LEE, Samuel (1783-1852). An English Orientalist. He was born at Longnor, in Shropshire, and graduated at Queen's College, Cambridge, in 1817. Two years afterwards he was chosen Arabic professor in the same university; was regius professor of Hebrew from 1831 to 1848; and at the time of his death was rector of Barley, Hertfordshire. His *Grammar of the Hebrew Language* (1830); his *Book of Job, Translated from the Original Hebrew* (1837); his *Hebrew, Chaldaic, and English Lexicon* (1840), and several other works won for him a high reputation.

LEE, Samuel Philips (1812-97). An American naval officer, born in Fairfax County, Va. He entered the United States Navy as a midshipman in 1825. In 1862, as commander of the *Oneida*, he participated in the capture of New Orleans by Farragut and in other operations on the Mississippi. In July of the same year he was commissioned captain, and was put in command of the North Atlantic Blockading Squadron. In the summer of 1864 he was transferred to the command of the Mississippi Squadron. He was commissioned commodore in 1866, and rear-admiral in 1870, when he was put in command of the North Atlantic fleet. He retired in 1875.

LEE, Sidney (1859—). An English scholar, born in London, December 5, 1859. He was educated at the City of London School and Balliol College, Oxford. In 1883 he became assistant editor of the *Dictionary of National Biography;* and on the retirement of Leslie Stephen (q.v.) in 1891 he was appointed editor-in-chief. Under his supervision appeared the last thirty-seven volumes. To the great work he contributed eight hundred and twenty articles, or three volumes. He is most favorably known for *Stratford-on-Avon from the Earliest Times to the Death of Shakespeare* (1885; new ed. 1890); a concise *Life of Shakespeare* (1898; abridged for the use of students, 1900); *A Life of Queen Victoria* (1902); *Facsimile Reprint of Shakespeare's First Folio* (1902); and his *Shakespeare First Folio Facsimile, with Introduction and Census of Extant Copies* (1902). He has also edited Lord Berner's translation of *Huon of Bordeaux* (1883-85) and the *Autobiography* of Lord Herbert of Cherbury (1886). In 1903 he visited the United States, lecturing in Boston and at the chief universities.

LEE, Sophia (1750-1824). An English novelist and dramatist, born in London. She was the daughter of John Lee, the actor, who was well known as a theatrical manager and a player of Shakespearean rôles. Her first success, a five-act comedy, entitled *The Chapter of Accidents*, was played and published in 1780. The profits of the venture enabled her to establish a ladies' seminary in Bath, which was speedily successful through her abilities as a teacher and the charm of her companionship, and which she continued to conduct until 1803. In 1785 she published *The Recess, or a Tale of Other Times*, which is among the first specimens of historical fiction in English, and in 1796 her tragedy *Almeyda, Queen of Grenada*, was played with Mrs. Siddons and Charles Kemble in the cast, but proved a failure. Her best-known work was done in collaboration with her sister Harriet Lee (q.v.), to whose *Canterbury Tales* she contributed two stories entitled *The Young Lady's Tale* and *The Clergyman's Tale*. Her other works include: *The Hermit's Tale* (1787); *The Life of a Lover* (1804); *The Assignation* (1807).

LEE, Vernon. The nom-de-plume of the English writer Violet Paget.

LEE, William (?-c.1610). An English stocking-weaver, born probably in Calverton, Nottinghamshire. He was educated at Oxford, took orders, and afterwards had a living at Calverton. In this town he invented his stocking-frame, and started a small manufactory. There was some interest taken in the invention by Queen Elizabeth and James I., but they were too conservative to consider it seriously, and Lee, having received much encouragement from Henry IV., went to France and set up his frames at Rouen. Here he worked with great success. After his death, which occurred soon after the assassination of Henry IV., Lee's workmen returned to England, and brought the valuable invention back with them.

LEE, William (1737-95). One of the representatives of the United States in Europe during the American Revolution; the fifth son of Thomas Lee and the brother of Richard Henry Lee, Francis Lightfoot Lee, and Arthur Lee. He was born in Stratford, Va., but some time before the Revolutionary War took up his residence as a merchant in London, where he acted as the agent of the Colony of Virginia for a time, and in 1773 was elected sheriff of Middlesex. He was an ardent partisan of Wilkes, and in 1775 was elected on the Wilkes ticket alderman of London, which position he held, nominally, until January, 1780. In June, 1777, he joined Thomas Morris in superintending the mercantile affairs of the United States at Nantes, and for a time had virtually entire charge of the commercial interests of the United States in France. On May 9, 1778, he was appointed by Congress a commissioner to the courts of Vienna and Berlin, but remained in Paris for nearly a year after receiving his commission, and subsequently lived at Frankfort, Germany, but accomplished nothing. In September, 1778, he drew up, with Jan Neufville, an

Amsterdam merchant, a commercial treaty which was indorsed by the burgomaster of Amsterdam, and which later served as a pretext for England's declaration of war against Holland. In June, 1779, Lee was recalled from his missions, both of which had been unsuccessful. He died at Green Spring, Va. Lee's diplomatic correspondence, together with a brief biographical sketch, may be found in Wharton (ed.), *The Revolutionary Diplomatic Correspondence of the United States* (Washington, 1889).

LEE, William Little (1821-57). An American lawyer. He was born at Sandy Hill, N. Y.; studied at Norwich University, Vt., and, after being superintendent of a military academy at Portsmouth, Va., also at the Harvard Law School. His practice in Troy, N. Y., was interrupted by threatening consumption, and in 1846 he started for Oregon by sea, but was delayed at Honolulu; undertook several suits for the Government and was made Hawaiian Chief Justice and Chancellor. He drew up a new constitution and civil and criminal codes, and was appointed president of the commission which was to have charge of the land given up to the common people by the King and chiefs, a measure proposed by him. In 1855 he went to the United States, and negotiated a reciprocity treaty between that country and Hawaii.

LEECH (AS. *læce*, leech, physician, Goth. *lēkeis*, OHG. *lāhhi*, *lāchi*, physician, from AS. *lāc*, medicine, gift). An annelid of the order or class Hirudinea, divided into a number of groups, Hirudinidæ, etc., some of which contain many species. They are mostly inhabitants of fresh waters, although some live in grass, etc., in moist places, and some are marine. They are most common in warm climates. The body is soft, and composed of segments (e.g. Pontobdella) like that of the earth-worm, but not furnished with bristles, except in one genus, to aid in progression as in the earth-worm; instead of which, a sucking-disk at each extremity enables the leech to avail itself of its power of elongating and shortening its body, by means of which it moves with considerable rapidity. The external rings (annuli) which show in the body-wall do not correspond to the inner segments, but are much more numerous. While there are usually 33 segments, the number of rings may be more than 200. There are, at the middle of the body, 3, 5, 6, or 12 rings to each segment. The mouth is in the anterior sucking-disk. The mouth of many of the species is admirably adapted not only for killing and eating the minute aquatic animals which constitute their ordinary food, but for making little wounds in the higher animals, through which blood may be sucked. The mouth of the medicinal leech has three small, white, hard pharyngeal teeth, minutely serrated along the edges, and curved so as to form little semicircular saws, provided with muscles powerful enough to work them with great effect, and to produce a triradiate wound, i.e. three short, deep gashes, radiating from a common centre, whence some of the rather fanciful names, such as dragon-leech. The stomach is very large, and is divided into compartments, some of which have large lateral cæca; and a leech which has once gorged itself with blood retains a store for a very long time, little changed, in these receptacles, while the digestive process goes slowly on. The circulatory system consists of four great pulsating trunks—one dorsal, one ventral, and two lateral—with their branches; there is no heart. The blood system is in such close and intimate relation with the body-cavity that it is difficult to determine accurately the limits of each. The aëration of the blood takes place in the skin, or rarely by special outgrowths of the body-walls, which function as gills. Leeches are oviparous, and each individual is hermaphroditic, while in certain allied forms (Histriobdella, etc.) the sexes are distinct. The eggs are laid in sacs, or, as in Clepsine, the fish-leech, are covered with a transparent fluid substance which hardens and envelops the eggs. Development is usually direct, and there is no metamorphosis, the young being like the adult. When feeding the leeches pair and one impregnates the other by passing spermatophores through the penis into the vagina. Simultaneous mutual fertilization has also been described. They have small eyes (in the medicinal leech ten), which appear as black spots on the dorsal side of the segments back of the mouth. These eyes are very simple and seem to be merely modified sense-papillæ, of which there are many arranged in longitudinal rows, the whole length of the body. Leeches vary much in size and color. Some species are less than half an inch long, while *Macrobdella valdriana* is said to reach a length of two and a half feet. Some are very slender, while others are broad and very flat. The colors are usually dull gray, brown, dark green, and black.

Leeches frequently change their skin; and one cause of the great mortality so often experienced among leeches kept for medicinal use is the want of aquatic plants in the vessels containing them, among which to rub themselves for aid in this process, and for getting quit of the slime which their skins exude. Leech aquaria in which aquatic plants grow are, therefore, much more favorable for the health of leeches than the tanks and vessels formerly in use. The medicinal leech (*Hirudo medicinalis*) is a European species, a rare native of Great Britain; leeches, however, are generally imported from Hamburg and from the south of Europe. The ancients were well acquainted with leeches, but their medicinal use seems to have originated in the Middle Ages. The horse-leech (*Hæmopis sanguisorba*) is common in Great Britain; it is much larger than the medicinal species, but its teeth are comparatively blunt, and it is little of a blood-sucker, and useless for medicinal purposes. In many parts of India, as in the warm valleys of the Himalaya, the moist grass swarms with leeches, some of them very small, but very troublesome to cattle and men who have occasion to walk through the grass. The moist valleys of Java, Sumatra, Chile, and other tropical countries swarm with land-leeches. Many species of leech are found in the United States, the most common ones belonging to the genera Nephelis and Glossiphonia (better known as Clepsine). For a synopsis of the North American species, consult: Verrill, *Invertebrate Animals of Vineyard Sound* (Washington, 1874); Moore, "The Leeches of the United States National Museum," in *Proceedings of the United States National Museum*, vol. xxi. (Washington, 1898).

LEECH, John (1817-64). An English caricaturist. He was born in London, August 29, 1817, and was educated at the Charterhouse, where he formed his lifelong friendship with Thackeray.

At the wish of his father he studied medicine at Saint Bartholomew's, where he was most distinguished for his anatomical drawings, a talent which he turned to account on the collapse of his father's fortune. In art he was practically self-taught. His first work, "Etchings and Sketches by A. Pen, Esq." (1835), was a series of street characters, drawn on stone. After this appeared his sketches in Bell's *Life in London*. After designing for various magazines and executing several series of plates in collaboration with Percival Leigh, he became associated with *Punch* (1841). His sketches for *Punch*, upon which his fame chiefly rests, were separately published under the title "Pictures of Life and Character" (1854-69). Among the works which he illustrated were Dickens's *Christmas Stories* (1843-48), *Comic History of England* (1847-48), and its companion-piece, *Comic History of Rome* (1852). In 1858 he journeyed through Ireland, the outcome of which was a book *Little Tour in Ireland*, written by his traveling companion, Dr. Hole, which he illustrated. He also designed illustrations for the *Illustrated London News*, *Punch's Pocket Book*, and *Once a Week*. He died at Kensington (London), October 29, 1864.

Leech represents the transition from Cruikshank to Du Maurier, when humorous art was progressing from the coarse and boisterous satire of earlier times to the more refined forms of the present day. The work of Leech was more refined than that of Cruikshank, although he had as keen an eye for the ridiculous, and his caricatures were truer to life. Consult the biographies of Leech by Brown (London, 1882) and Frith (ib., 1891).

LEECHING (AS. *læce*, leech, physician, Goth. *lēkeis*, OHG. *lāhhi*, *lāchi*, physician, from *lāc*, medicine; the worm is so called from its medicinal use). The application of leeches for the purpose of abstracting blood. This method of blood-letting is employed in medicine in place of cupping or venesection in the case of local inflammation or acute congestion. Having attached itself to the integument by means of teeth and suction apparatus, the leech secretes a liquid which prevents the blood from coagulating; and hence the persistent bleeding in some cases after a leech is removed. A leech is most easily applied by inserting it tail end first in a small, narrow bottle, and then inverting the bottle against the skin, and letting the leech slide down. If it refuses to bite, a few drops of sweetened milk or of blood put on the skin will overcome its reluctance and incite it to attach itself. The leech may be detached by sprinkling salt on it. At each application a leech ordinarily takes about one drachm of blood. It may be made to disgorge by treating it with salt, or by stripping it gently from tail to head. Leech-bites leave deep and permanent though small scars. Leeches are employed in cases of meningitis, in conjunctivitis, in purulent inflammation of the external ear, and in the treatment of swollen joints, such as occur after a traumatism. The troublesome bleeding which follows in some cases is treated with styptics, or with pressure of a gauze compress over the wound.

The use of leeches is not cleanly nor aseptic, and occasionally infection follows. Hence many prefer to employ the 'artificial leech,' which consists of a tube provided with a piston for exhausting the air within it. A scarificator having first been used, the margin of the end of the tube is anointed and placed firmly against the skin, and the air exhausted. Blood passes out into the tube. The best 'artificial leech' is that devised by Dench of New York.

LEECH LAKE. A lake in Cass County, north central Minnesota (Map: Minnesota, D 3). It is nearly 25 miles long, 15 miles broad, and lies at an elevation of 1297 feet; it discharges its waters by a short outlet into the Mississippi. The surrounding country is well timbered and constitutes the Leech Lake Indian Reservation.

LEEDS. A town in the northwest of the West Riding of Yorkshire, England, in the valley of the Aire, 22 miles west-southwest of York (Map: England, E 3). It is the first town in the county and the fifth in England in point of population. It lies in an extensive coal-field and in a productive agricultural and grazing region. The Aire River, which has been open for navigation since 1659, flows into the Humber, and affords communication with the sea on the east; to the west water communication is afforded by the Leeds and Liverpool Canal, finished in 1816. The railway facilities are exceptionally fine. The notable buildings include the Church of Saint Peter's, a noble edifice; and Saint John's, New Briggate, consecrated by Archbishop Neale in 1634, an almost unique example of a 'Laudian' church still retaining the original fittings. There is also the town hall, with a tower 225 feet high. Its great hall, 161 feet long, 72 feet wide, and 75 feet high, is richly decorated, and contains one of the largest and most powerful organs in Europe. There is a colossal statue of Queen Victoria in the vestibule, and one of Wellington in the front of the building. Kirkstall Abbey, about 3 miles from Leeds, was founded between 1147 and 1153 by Henry de Lacie for the Cistercian Order of monks. It is a fine old ruin, remarkable for its simple grandeur and unity of design. It was bought by Colonel North and presented to the borough in 1888. Adel Church, about four miles from Leeds, is an interesting building, erected in 1140. Near it was a Roman station where antiquities have been found. There are many charitable institutions, among which are the Harrison almshouses, the fever and smallpox hospitals of the municipality, an excellent infirmary, etc. The Yorkshire College, affiliated with the Victoria University, has several fine college buildings, with well-equipped departments of chemistry, engineering, biology, art, and technical training, as well as a medical department, which is located near the Leeds Infirmary. The public recreation grounds, owned by the corporation, are Woodhouse Moor, Hunslet Moor, Ivy House Estate, East End Park, and Armley Park. Roundhay Park, one of the most beautiful demesnes in England, at a distance of 2 miles from Leeds, was bought by the corporation of the town in 1872 for £140,000, and converted into a recreation-ground for the use of the public. The municipal activity of the City Council is indicated by 65 committees, comprising 15 standing committees, 40 sub-committees, and 8 sections. The borough is divided into 16 wards, and is governed by a mayor, 16 aldermen, and 48 councilors. The municipality owns fish, cattle, fruit, and corn markets, gas and water works, and electric lighting plant, tramways, baths, free libraries, and cemeteries; subsidizes institutions for technical education; and maintains a fire brigade, an effective police force, and bands of music for the summer season. It provides garden-lots for artisans and other people of small means, and has modern sewage-works for converting the refuse into fertilizers.

Leeds is the great centre of the British woolen trade. Among the staple manufactures are fine broadcloths, army clothing, and fancy cloths sent from neighboring towns to be finished in Leeds. There are also important manufactures of felt carpeting and drugget. The iron industry includes the smelting of ore, founding, and the manufacture of machinery, engines, agricultural implements, etc. There are extensive manufactures of fine decorative earthenware, leather, shoes, ready-made clothing, chemicals, flax, silks, glass, railway cars, tobacco, paper, fire-brick, etc. The estimated annual value of Leed's products is $55,000,000.

Probably named after a British chief, Lede or Leod, in Saxon times Leeds was an important centre, and is called Loides-in-Elmeto by Bede. Its charters, the first dating from 1208, were granted in the reigns of Kings John, Charles I., Charles II., and James II. It was made a city in 1893, and sends five members to Parliament. At her jubilee in 1897, Queen Victoria created the chief magistrate Lord Mayor. Population, in 1801, 53,200; in 1851, 172,300; in 1891, 367,500; in 1901, 429,000. Consult: Thoresby, *Ducatus Leodiensis* (Leeds, 1715); Whitaker, *Loidis and Elmete* (Leeds, 1816); Baines, *Historic Sketch of Leeds* (Leeds, 1822); Jackson, *Guide to Leeds* (Leeds, 1889); Kidson, *Historical Notices of the Leeds Potteries* (Leeds, 1892).

LEEDS, Duke of. See Danby, Thomas Osborne, Earl of.

LEEDS MUSICAL FESTIVAL. One of the minor musical festivals of England. The first festival was held in 1767, to raise funds for the city hospital which had been inaugurated in that year. The next festival was held in 1858, in the new Town Hall, immediately after its opening by Queen Victoria. Another festival was held in 1874 and again in 1877, since when they have been given triennially and the proceeds devoted to the city hospital.

LEE-HAM'ILTON, Eugene (1845—). An English poet, born in London. He was educated in France, Germany, and at Oxford; entered diplomatic service, took part in the Alabama arbitration at Geneva, and was secretary of the legation at Lisbon. His health failing, he retired to Italy, where he lived with his half-sister, Violet Paget (q.v.). Among his volumes are *Poems and Transcripts* (1878); *Apollo and Marsyas* (1884); *Imaginary Sonnets* (1888); *The Fountain of Youth, a Fantastic Tragedy in Five Acts* (1891); *Sonnets of the Wingless Hours* (1894); *Forest Notes* (1899); and a translation of Dante's *Inferno* (1898).

LEEK. A manufacturing and market town in Staffordshire, England, 24 miles northeast of Stafford (Map: England, E 3). The parish church dates from 1180. The town contains numerous educational and benevolent institutions. It has manufactures of silk goods and agricultural implements. It owns the gas and water works, markets, cemetery, and public baths, and maintains an isolation hospital, public library, and technical school. The town charter was granted by King John in 1208. Population, in 1891, 14,128; in 1901, 15,500.

LEEK (AS. *lēac*, OHG. *louh*, Ger. *Lauch;* possibly connected with OIr. *luss*, plant), *Allium porrum.* A biennial plant of the order Liliaceæ, a native of the south of Europe. It is closely related to the onion, but instead of a bulb has a slight thickening at the base of the stem which may reach a height of 3 feet. The leaves are about an inch wide and a foot or more long; the flowers in a large and very dense terminal globular umbel, which is not bulbiferous. The leek has been long in cultivation, and some of the varieties exhibit the effects of cultivation in greatly increased size and delicacy. The lower part of the stem, before it has run up into a flower-stalk, blanched by earthing up or other means which also induce it to swell and extend, is much esteemed in Europe for culinary purposes, but in America has not become widely popular. Its flavor is much milder than that of the onion. It is generally sown in spring, and is used during the following winter. It flourishes in a rich but light and dry soil. Gardeners often transplant seedling leeks instead of merely thinning out the original rows. In general, the culture of leeks is similar to that of the onion. See plate of Onions, Oyster-Plant, etc.

LEER, lār. A town of East Friesland, in the Province of Hanover, Prussia, 50 miles by rail west-northwest of Oldenburg, on the right bank of the Leda, near its junction with the Ems (Map: Prussia, B 2). It is an important industrial town, with manufactures of machinery, cigars, tobacco, etc., breweries, distilleries, iron-foundries, and ship-building yards. It carries on an extensive foreign trade in grain, groceries, animal and dairy products, and in its own manufactures. Population, in 1890, 11,075; in 1900, 12,302. Leer is believed to be one of the oldest towns of the province, although it obtained municipal rights only in 1823.

LEES'BURG. A town and the county-seat of Loudoun County, Va., 38 miles northwest of Alexandria; on the Southern Railway (Map: Virginia, G 2). It is the centre of a rich agricultural, stock-raising, and dairying region, and has some manufactures. Population, in 1890, 1650; in 1900, 1513.

LEETE, William (c.1603-83). A colonial Governor of Connecticut. He was born in England, where he studied law and served for a time in the Bishop's Court at Cambridge. He turned Puritan; emigrated to America in 1637; settled in the New Haven Colony in 1639; and was one of the founders of Guilford and a 'pillar of the church' there. He served as Deputy Governor of New Haven from 1658 to 1661, and then as Governor until the Colony was united with Connecticut under the royal charter of 1662. He is said to have harbored the regicides Goffe and Whalley, and he certainly evaded the demands of the royal emissaries for their arrest. He was Deputy Governor of the united Colony from 1669 to 1676, and was then Governor until his death.

LEEUWARDEN, lā'vär'den. A town of the Netherlands, capital of the Province of Friesland, in a rich and extensive plain, on the Harlingen and Gröningen Canal, 16 miles east-northeast of Harlingen (Map: Netherlands, D 1). Numerous canals intersect the town, its streets are straight, and walks have been laid out on the site of the former fortifications. Leeuwarden has a handsome town hall and an ancient palace of the Stadtholder of Friesland. There are several learned societies, among them the Frisian Society for the study of history, antiquities, and language, which possesses an interesting museum. The town has several libraries. The Gothic chancery of the sixteenth century was formerly the seat of the law court for Friesland. The industries include the manufacture of gold and silver ware, musical instruments, and mirrors. The town is a large fruit and beef market, and trades in flax, chicory, woolen goods, groceries, wines, and brandy. Population, in 1892, 30,689; in 1900, 32,162. Leeuwarden was a walled town as early as 1190, and till the end of the thirteenth century was a port on a bay called the Borndiep, which the drifting sand gradually filled up.

LEEUWENHOEK, lā′ven-ho͝ok, Antonius van (1632-1723). A Dutch naturalist, born at Delft. He did not receive a learned education, but he was a man of means who devoted himself to the manufacture of lenses and to the investigation of microscopic forms of life, without, however, following any scientific plan of procedure. He discovered and identified the red corpuscles of the blood, described striated muscle-fibres, and demonstrated the circulation of the blood in the capillaries. He was also the first to find Hydra, Infusoria, and rotifers, many species of which he described. Spermatozoa (q.v.) were first seen by his pupil Ludwig Hamm. Leeuwenhoek studied the anatomy of many insects and observed the parthenogenetic reproduction of aphides. He disproved many cases of supposed spontaneous generation among animals. Most of Leeuwenhoek's writings were published in London in the *Philosophical Transactions* of the Royal Society, and in the *Mémoires* of the Paris Academy. His works were published in Leyden, under the title *Opera Omnia, sive Arcana Naturæ Ope Exactissimorum Microscopiorum Detecta* (1724).

LEEUWIN, lo͞o′ĭn, Cape. The southwest extremity of Australia, marked by a first-class lighthouse, visible at 20 miles (Map: Australia, A 5). It was first sighted, in 1622, from the *Leeuwin*, a Dutch vessel.

LEEWARD, lo͞o′ẽrd, **ISLANDS.** A part of the West India group. The name has four distinct applications: geographically, it is sometimes used in reference to the Greater Antilles and adjacent islands, sometimes to the islands off the Venezuelan coast west of Trinidad (these were the Leeward Islands of the Spaniards), and sometimes to the islands lying between the Virgin group and Martinique (in the first two cases the name was used to denote islands not directly exposed to the trade winds); politically, the name is applied to a British colony erected in 1871 and consisting of Antigua, Montserrat, Saint Christopher and Nevis, a part of the Virgin group, Dominica, and their dependencies. The area of the colony is about 700 square miles; population, in 1901, 127,434, of whom about 95 per cent. were negroes and colored persons. See articles on the islands named above.

LEEWAY. When a ship is steering in any direction, and a strong wind is blowing, so as to make an acute angle with the direction of the ship, the ship's actual course is the resultant of two forces, one represented by her headway (or locomotive power), the other by the force urging her in the direction of the wind. This resultant must be somewhat between the two; and, with the same power of wind, the angle between the direction in which the ship is steering and the resultant will be great or small as the headway is diminished or increased. This angle represents the leeway; and the distance lost to leeward is shown by the side of the triangle subtending this angle. In computations of the course pursued, allowance has to be made for leeway.

LEFANU, le-fȧ-no͞o′, Joseph Sheridan (1814-73). An Irish novelist and journalist, born in Dublin. He was educated at Trinity College, Dublin; joined the staff of the *Dublin University Magazine* (1837), and was its editor and proprietor from 1839 till 1872; purchased three Dublin papers, and united them in the *Evening Mail* (1839); and wrote several capital Irish novels. Of his novels the best is *Uncle Silas* (1864). He wrote two fine Irish ballads, "Phaudhrig Croohoore" and "Shamus O'Brien." His *Purcell Papers*, a series of Irish stories, were edited with a memoir by A. P. Graves (London, 1880).

LEFÉBURE-WÉLY, le-fā′bur′ vā′lā′, Louis James Alfred (1817-69). A French organist and composer, born in Paris. When only fifteen years old he succeeded his father as organist at Saint Roch. In 1832 he entered the Conservatory, and in 1834 won two second, and the next year two first prizes. He further studied composition, counterpoint, and the organ with Halévy, Berton, Adam, and Séjan. From 1847 to 1858 he was organist at the Madeleine, and, from 1863 to his death, at Saint Sulpice. In 1850 he received the decoration of the Legion of Honor. As an organist he was especially famous for his wonderful improvisation. His piano compositions were popular, but his organ pieces, "Cantiques," and "Offertoires" are superior. He also wrote an opéra comique, *Les recruteurs* (1861), symphonies for orchestra, chamber-music, and masses.

LEFEBVRE, le-fā′vr′, François Joseph, Duke of Denzig (1755-1820). A marshal of France. He was born at Ruffach, in Alsace, entered the army at eighteen, and was a sergeant in the French Guards when the Revolution broke out. He rose rapidly in rank. Hoche in 1793 made him brigadier-general, and the next year general of division. He fought at Fleurus, and along the Rhine from 1794 to 1797. In that year he was commander-in-chief of all the French armies for a few months after the death of Hoche. He took part with Bonaparte in the coup-d'état of 1799, and in 1804 was made a marshal of the Empire. He distinguished himself in the war against Prussia in 1806-07. He conducted the siege of Danzig, and after its capture was created Duke of Danzig. He won fresh laurels in the campaign in Spain in 1808, especially by his capture of Bilbao and Segovia. In 1809 he was present at Eckmühl and Wagram, and put down the insurrection in the Tyrol. During the Russian campaign he had the command of the Imperial Guard, and in 1814 fought valiantly against the Allies in France. Submitting to the Bourbons after Napoleon's abdication, he was made a peer.

LEFEBVRE, Jules Joseph (1834—). A French historical and portrait painter. He was born at Tournan, Seine-et-Marne. A pupil of Léon Cogniet, he won the Prix de Rome in 1861 with the "Death of Priam." He is a rival of Henner in painting beautiful women; but, however delicate in finish, his manner has an almost classic simplicity. His drawing is correct and his knowledge of form is complete, but his treatment is smooth, and he represents the academic tendencies of to-day. His works consist mostly of single figures. He sent from Rome "Caritas Romana" (1864); "Sleeping Maiden" (1865); "Nymph with the Infant Bacchus" (1866), now in the Luxembourg. He created a great sensation with his "Reclining Woman" (1868), and with the allegory of "Truth" (1870), a nude woman holding aloft a mirror, probably the best known of his works, and now in the Luxembourg. His other works include: the "Grasshopper" (1878); "Graziella" (1878), in the Metropolitan Museum, New York; "Slave Carrying Fruit" (1874), Ghent Museum; "Chloe" (1875); "Pandora" (1877); "La Fiametta" (1881), from Boccaccio; "Psyche" (1883); "Lady Godiva" (1890); "A Daughter of Eve" (1892). Among his portraits were those of M. L. Raynaud and the Prince Imperial (1874). He obtained medals in 1865, 1868, and 1870, and a first-class medal at the Paris Exhibition of 1878. He was decorated with the cross of the Legion of Honor in 1870, made an officer in 1878, and member of the Académie des Beaux-Arts in 1891.

LEFEBVRE-DESNOUETTES, le-fĕ′vr′-dā′-nōō′ĕt′, Charles, Count (1773-1822). A French general, born in Paris. He entered the French army, serving in Belgium in 1792, and afterwards as aide-de-camp to Napoleon at Marengo. He distinguished himself at Austerlitz; was made brigadier, and in 1808 general of division. At the siege of Saragossa he was taken prisoner by the English, but escaped from England and took part in the Austrian, Russian, and Prussian campaigns, and fought in France against the Allies in 1814. He was made a peer by Napoleon in 1815, and was at Fleurus and Waterloo. Condemned to death by the Bourbons, he escaped to the United States, and attempted to establish a colony of French refugees in Alabama. Despondent and homesick, he obtained permission to return to France, set out joyfully, and was drowned off the coast of Ireland.

LEFÈVRE, le′fĕ′vr′, **FAVRE**, fȧ′vr′, or **FABER**, fȧ′bâr′, Pierre (1506-46). One of the six coadjutors of Loyola in the establishment of the Order of Jesuits. He was born at Villaret, in Savoy. He came of a peasant family, and was educated at the College of Sainte-Barbe in Paris, where he became Loyola's tutor and closest friend. With five others he laid the foundations of the Order at Montmartre, August 15, 1534. Lefèvre received the appointment of professor of theology in the Collegio di Sapienza in Rome in 1537, and the next year was sent to Parma on a special mission for the reformation of the diocese. He visited Germany in 1541, when he disputed with the Reformers at Ratisbon, and again in 1544, when he founded the Jesuit College at Cologne. He established the Jesuit colleges at Coimbra, Madrid, Valladolid, and Valencia. He died in 1546, when on his way to join the Council of Trent. After his death he was canonized. Lefèvre was a man of great earnestness, learning, and eloquence, kindly in nature and pure in life.

LE FÈVRE D'ESTAPLES, dȧ′tȧ′pl′, Jacques. See Faber, Jacques Le Fevre d'Estaples.

LEFFERTS, Marshall (1821-76). An American engineer, born at Bedford, Long Island. After a common-school education he became a clerk, then a civil engineer, and then went into business. For eleven years (1849-60) he was associated with different telegraph companies. He patented an automatic system of telegraphic transmission, became electrical engineer of the American Telegraph Company, and consulting engineer of the Atlantic Cable Company, for which he made valuable inventions. In 1861 he went South in command of the Seventh Regiment; was called out again in 1862 and in 1863; and was on duty in New York City during the draft riots of July, 1863. In 1867 he resigned his office with the Western Union (formerly the American) Telegraph Company, and became interested in its commercial news department. Two years later he became president of the Gold and Stock Telegraph Company, and in 1871 took control of the commercial news department after its purchase by this company.

LÉFKOSIA, lĕf′kō-sē′a. See Nicosia.

LE FLÔ, le flō, Adolphe Charles Emmanuel (1804-87). A French soldier and politician. He was born at Lesneven; was educated at the Military School of Saint-Cyr; and in 1830 joined the French army in the Algerian campaign. In 1848 he was promoted to be brigadier-general. In the same year he was sent as Ambassador to Russia, whence he returned in 1849 and became a member of the National Assembly. He was at first an adherent of Louis Napoleon, but finally opposed his designs, and was among those whom the coup-d'état of 1851 drove into exile. Returning to France in 1857, he lived in retirement until after the fall of Napoleon. During the German War of 1870-71 he was for a short time Minister of War, and at its close was appointed by Thiers to fill the same office. He soon resigned and was Ambassador to Russia from 1871 to 1879.

LEFORT, le-fôr′, François (1653 or 1656-99). A Russian admiral and statesman, born and educated at Geneva. After serving for some time in the French and Dutch navies, he entered the Russian Army, and distinguished himself against the Turks and Tatars. He took an active part in the intrigues which made Peter the Great the sole ruler of Russia. Peter never forgot Lefort, who became his favorite and devoted servant, and next to the Czar the most important personage in Russia. He was a man of great acuteness and ability, and with Patrick Gordon became a great force for occidental civilization in Russia. He remodeled the Russian Army and laid the foundation of the Russian Navy. In 1694 he was made admiral and generalissimo. When Peter the Great visited foreign countries in 1697 Lefort was the chief of the embassy, in the train of which the Czar traveled incognito.

LEFUEL, le-fwĕl′, Hector Martin (1810-81). A French architect, born at Versailles. He received instruction from his father and Huyot before he entered the Ecole des Beaux-Arts, where he won the Prix de Rome in 1839. His principal works were the buildings connecting the Louvre with the Tuileries. He succeeded Visconti (1854) as architect for this important structure, and somewhat modified his plans.

He was elected a member of the Institute in 1855. Other works of Lefuel are the national porcelain factories at Sèvres and the theatre in the Château of Fontainebleau.

LEG (from OIcel. *leggr*, leg, Dan. *læg*, Swed. *läg*, calf of the leg). That part of the lower extremity which lies between the knee and the ankle. It consists of two bones, the tibia and fibula (see SKELETON, FOOT), and of masses of muscles (together with nerves and vessels) which are held in their position by coverings of fascia, and are enveloped in the general integument.

The shaft of the tibia is of a triangular prismoid form, and presents three surfaces and three borders. The internal surface is smooth, convex, and broader above than below; except at its upper third, it lies directly under the skin, and may be readily traced by the hand. The external and the posterior surfaces are covered by numerous muscles. The muscular mass forming the calf (formed by the gastrocnemius, soleus, and plantaris muscles) is peculiar to man, and is directly connected with his erect attitude and his ordinary mode of progression. The anterior border of the tibia, the most prominent of the three, is popularly known as *the shin*, and may be traced down to the inner ankle. The fibula, or small bone of the leg, lies on the outer surface of the tibia, and articulates with its upper and lower extremities, and with the astragalus inferiorly. It affords attachments to many of the muscles of this region. The region is nourished by the anterior and posterior tibial arteries, into which the popliteal artery separates. Both these arteries occasionally require to be tied by the surgeon in cases of wounds or aneurism. The blood is returned toward the heart by two sets of veins—the deep, which accompany the arteries, and the superficial, which are known as the internal or long saphenous, and the external or short saphenous veins. These superficial veins are very liable to become permanently dilated or varicose (a condition the nature and treatment of which are considered in the article VARICOSE VEINS), if there is any impediment to the free transmission of the blood, or even from the mere weight of the ascending column of blood, in persons whose occupation requires continuous standing. The nerves of the leg, both sensory and motor, are derived from the great sciatic nerve and from its terminal branches, the internal popliteal and the external popliteal or peroneal nerve. In cases of fracture or broken leg, the two bones are more frequently broken together than singly, and the most common situation is at the lower third. The tibia is more liable to fracture than the fibula, in consequence of its sustaining the whole weight of the body, while the fibula has nothing to support.

BANDY-LEG, or BOW-LEG. This is a condition in which the curve of the tibia is increased and the leg is bowed with the concavity inward. It is due to allowing a child to walk too early, or to rickets (q.v.), or rarely to muscular contraction before the child is put on his feet. The condition may be remedied by means of a surgical operation, in which the outer condyle of the femur is cut off in a slanting line, and the limb aligned, after which the condyle is allowed to knit to the femur in its new position.

KNOCK-KNEE. This is a condition in which the curve of each leg is much increased, with the concavity outward, so that the knees are approximated and may even touch. The cause is generally rickets, and the remedy is the same as in bow-leg.

LEGACY (OF. *legacie*, from Lat. *legatum*, bequest, from *legare*, to bequeath, send on a commission, from *lex*, law). A gift of a chattel or sum of money made by the will of a deceased person. The term is synonymous with bequest. (See WILL.) Devise (q.v.) is the corresponding term in case of gifts by will or of real estate.

Legacies may be either *specific* or *general*. A specific legacy is a bequest of a specific thing, as a particular horse, picture, piece of silver, or other article. A general legacy is a bequest payable out of the general assets of the estate of the deceased person. It may be a gift of money or it may be of property without in any manner separating or distinguishing it from other property of like kind belonging to the testator. The important difference between the two kinds of legacies is that if the subject-matter of the specific legacy fail, that is, if the picture be destroyed or disposed of by the testator during his lifetime, or if the horse die, the legacy lapses and the legatee takes nothing under his bequest. In the case of general legacies, as the legacy is not to be paid by or out of any particular property, the legacy does not lapse so long as there are any assets of the estate applicable to the payment of legacies. When, however, there are not sufficient assets in the estate (after paying the testator's debts, which must first be paid) to pay legacies, the specific legacies must be paid in preference to general legacies, which must abate, i.e. be reduced pro rata. The order of abatement may, however, be fixed by the terms of the will.

A third class of legacies, which partakes of the character of both specific and general legacies, consists of what are known as *demonstrative* legacies. A demonstrative legacy is one which the testator directs to be given out of specific money or property or its proceeds, as, for example, a gift of a certain number of stocks and bonds out of a larger number, or of a chattel to be purchased out of the proceeds of a certain portion of the testator's estate. The demonstrative legacy is like a specific legacy in that it is given out of a specific fund, and in that it does not abate with general legacies, but it is like a general legacy in that it does not generally abate with the loss of the particular fund or property out of which it is to be paid. Legacies may also be either *absolute*, that is, one which vests absolutely in the legatee on the testator's death without condition; or *conditional* or *contingent*, that is, one to which the legatee does not become entitled until the happening of some certain event after the testator's death. It is generally provided by statute that legacies are not payable until the expiration of one year after the testator's death, from which date interest is payable on the legacy if there are funds and it is not otherwise provided by the will.

If the legatee dies before the testator the legacy in general lapses and will pass to the residuary legatee, that is, the one to whom the will gives all personal property not otherwise disposed of. If there is no residuary clause in the will, lapsed legacies pass under the statutes of distribution in force in the various jurisdictions to the next of kin of the testator. In a few States it is provided by statute that legacies to a child of the testator in case of the child's death before the death of the testator, shall go to the child's issue. Legacies may also in effect lapse by ademption, i.e. some act of the testator during his lifetime by which he pays or satisfies the legacy in advance of his death. (See ADEMPTION.) In general any legal person may be a legatee. Legacies to a married woman, however, upon payment, vest in her husband at common law, and a legacy to an infant is payable to his guardian for the infant's benefit. In many States there are various statutes limiting the power of a testator to make bequests to corporations and to aliens, so that bequests to corporations, and also for charitable uses not authorized by the statute, are void. (See USES and TRUSTS.) Formerly a bequest to the witness of a will rendered the will void. Now, under most statutes of wills the will is valid, but the bequest is void. In some States bequests to the testator's illegitimate children are void. In general such bequests are valid, but the word children, when used in a will, will be deemed to mean legitimate children, if there are such, to the exclusion of illegitimate. The more important rules as to the construction of clauses giving bequests are discussed under WILL. See also ADMINISTRATION. Consult the authorities referred to under WILL.

LEGAL EDUCATION. ON THE CONTINENT OF EUROPE BEFORE 1088. In the time of the Roman Republic it was customary for a prospective lawyer to begin at the age of sixteen to listen systematically to the advice given to clients by some learned jurisconsult, and the student also had to familiarize himself with the Twelve Tables. It was thus that Cicero learned law under the two Scævolas. In the time of Augustus the study of the Twelve Tables was superseded by the study of the Prætorian Edict. About the same time certain jurisconsults began to devote themselves principally to giving instruction. Among the earliest and most famous of these teachers were Labeo and Sabinus, to-day best remembered for their connection with the two sects of lawyers, the Proculians and the Sabinians. From about the beginning of the third century there were systematic law schools, especially at Rome and at Constantinople. The course in the law schools covered four years, and students were supposed to complete it at the age of twenty. Before 533 the texts studied were the Institutes of Gaius, the same author's treatises on married women's property, guardianship, wills, and legacies, the Prætorian Edict, Papinian, Paulus, and the Constitutions. By a Constitution of 533 the course of study was rearranged, and the old texts gave place to Justinian's Institutes, Digest, and Code. The framing of the *Corpus Juris Civilis*, indeed, was partly guided by the needs of students and was largely executed by the professors of Constantinople and Berytus.

In the East the study of the *Corpus Juris Civilis* was superseded by Greek paraphrases and then by new treatises. In Italy, however, the study of the *Corpus Juris Civilis* was never wholly abandoned. It is not known to what extent there was systematic study of law in the Dark Ages, but in the eleventh century Pavia and Ravenna were centres of law teaching, the former being preëminent in Lombard law and the latter in Roman law.

ON THE CONTINENT OF EUROPE SINCE 1088. The year 1088 has become recognized rather arbitrarily as the beginning of European university instruction. It is taken as the year of the founding of the University of Bologna, because it marks, as nearly as practicable, the commencement of the teaching of law by Irnerius. This teacher made Bologna famous as a place for studying the *Corpus Juris Civilis* and attracted pupils from the whole civilized world. In addition to bringing this study into renewed prominence, he conferred upon legal education the great benefit of introducing students to the entire Digest, and thus he encouraged thorough work and the pursuit of a long course. By the middle of the twelfth century the appearance of Gratian's Decretum made possible a systematic study of the canon law, and soon Bologna became a favorite resort for students of the *Corpus Juris Canonici*. Academic degrees appeared in the thirteenth century. Early in the fifteenth century the statutes as to degrees indicate that the student of the *Corpus Juris Civilis* became a bachelor in about five years and that two years later he was eligible to become *Legum Doctor*—in other words, to receive a diploma certifying his ability to lecture upon the *leges*, as the paragraphs of the Digest are called. Four years of study made a student of the *Corpus Juris Canonici* a Bachelor, and two years later he might receive the degree of *Decretorum Doctor*. The student who combined the two kinds of law might become *Juris Utriusque Doctor* in ten years after beginning study. The teaching was by lectures which elucidated the text, developed a systematic view of the subject, and solved hypothetical problems. Soon after the time of Irnerius the study of the civil and the canon law spread to the universities that gradually arose in all parts of Europe.

Throughout the Continent of Europe the universities are to-day the only route to the legal profession. The requirement for admission to the course in law is a general education substantially equivalent to that acquired by two or three years of residence as an undergraduate of an American college. The course in law covers not less than three nor more than four years. From country to country, there are some differences in details. In Germany, for example, the degree *Juris Utriusque Doctor* does not admit to the bar, and need not be taken by the prospective lawyer; and admission to the bar is secured exclusively through a Government examination, for which, however, university work equivalent to the requirements for a degree affords the only possible preparation; and the examination must be succeeded by practical work for three years, in which time the candidate passes successively from administrative duties to assisting a judge of one of the lower courts and then to helping a practicing lawyer with the daily tasks of a law office; and for persons hoping to become administrative or judicial officers these three years of practical work are followed by a second Government examination. In France, on the other hand, the degrees are a baccalaureate in two years, a licentiate in three years, and a doctorate in four years; and the licentiate degree admits to the bar as an *avocat*, whereas two years of study under the law faculty suffice, without a degree either in general knowledge or in law, to admit the candidate to the grade of an *avoué*. Finally, in Germany, but not in France, almost all legal instruction is given by persons who have never been engaged in practice.

In England. The study of the *Corpus Juris Civilis* and of the *Corpus Juris Canonici* seems to have entered the English universities as soon as they were founded; and, indeed, there is a commonly received opinion that the Lombard jurist Vacarius taught civil law at Oxford in 1149, a date eighteen years before the University of Oxford can be proved to have been in existence. The civil law continues to be taught in the English universities. The canon law ceased to be taught after the Reformation. The common law found little recognition in the universities until recently; and, indeed, even to-day the universities can hardly be said to be making a serious attempt to become places for the professional study of law. The famous lectures on the common law delivered at Oxford by Blackstone, beginning in 1753, were addressed to audiences largely composed of undergraduates, and kept in mind to a considerable extent the needs of persons who, without intending to enter the profession, wished to learn the general features of the political and legal system of their country. To an American it seems strange that this auspicious beginning did not lead to a professional school of law; but in fact such a development at the universities seems contrary to the desires of the universities and of the profession. Both Oxford and Cambridge have a considerable number of teachers of civil law and of common law; but the instruction gives less prominence to common law than to civil law and to such comparatively non-professional topics as constitutional law, international law, and analytical jurisprudence; and the courses are taken chiefly by undergraduates as part of their preparation for the degree of bachelor of arts. There is provision, both by instruction and by appropriate degrees, for law study by graduates in arts who expect to become lawyers, but these law degrees, of which fewer than twenty are annually conferred in each university, are taken chiefly by persons who have pursued the requisite studies in London. Indeed, the Inns of Court, which alone have the power to call to the bar, continue to be substantially the only centres for a barrister's education. These four Inns—the Inner Temple, the Middle Temple, Lincoln's Inn, and Gray's Inn—have been for about six centuries the learned societies to which every barrister belongs, and their historic associations, even independently of the conservatism of the profession, render it very difficult for legal education to become domiciled elsewhere. Their origin, or at least their importance, seems to have some connection with the fixing of the Court of Common Pleas at Westminster by reason of the provision in Magna Charta requiring that court to sit in one place. A picture of the student's life about the middle of the fifteenth century is given by Fortescue. At that time there were ten Inns of Chancery, besides the four Inns of Court, and it was common for students to begin with the former and to complete their education at the latter. The total residence requisite for admission to the bar was apparently eight years. This time, however, was not wholly devoted to law, for other accomplishments, including singing and dancing, were pursued by the students; and, indeed, it seems to have been common for persons who did not contemplate entering the profession to go to the Inns, rather than to the universities, for the final embellishments of education. In those days, during the four terms of court, all barristers were resident in the Inns, and thus the students had excellent means of preparation for the profession. There were systematic lectures, called readings, by barristers, and at public moot-courts and private boltings and even at meals the students discussed actual and hypothetical cases. There was, indeed, an atmosphere of law, much like the atmosphere of an American law school. In the sixteenth century students are known to have made great use of the *Natura Brevium*, the Old Tenures, and Littleton's Tenures; and the readings and mootings and boltings continued. After the middle of the seventeenth century Coke's Institutes became the chief text-book; and about the same time the old machinery of teaching began to be disused. In addition to the means of study already indicated, it is known that students made collections of notes from the Year Books and other reports of cases and that they spent much time in copying pleadings. From the middle of the eighteenth century the student, while keeping his terms at his Inn by eating such number of dinners as proved his residence, began his studies by copying pleadings in the office of a special pleader, and passed thence to the office of a barrister in general practice, paying to these instructors such substantial fees as procured adequate guidance in study. This remains the common mode of preparation. The student, after passing a preliminary entrance examination in grammar, composition, Latin, and the history of England—from which entrance examination he is exempt if a graduate of one of the universities—enrolls himself in one of the Inns. He next keeps twelve terms by eating six dinners at the Inn each term—though members of the universities need eat only three dinners each term. Meanwhile he has probably been passing six months in the office of a solicitor in good conveyancing practice and a year or two in the office of a barrister with a good chamber practice, and thus he has learned, among other things, to frame statements of cases to be submitted by a solicitor to a barrister, to give opinions upon such cases, and to frame pleadings. Simultaneously he attends court and does the reading necessary for the examinations for call to the bar. These examinations include Roman law and constitutional law; but they are devoted principally to the ordinary heads of English law and equity, and they cover the whole ground. In the absence of extraordinary circumstances, admission cannot occur until three years after entering the Inn. The examinations are conducted by the Council of Legal Education, which is appointed by the Inns. The Council maintains lectures by readers and assistant readers, but these lectures are not largely attended, and, though established half a century ago, have not yet made much impression upon the system of legal education.

The solicitors are under regulation by the Incorporated Law Society, which maintains lectures and examinations similar to those of the Council of Legal Education. The Incorporated Law Society, however, is the older body, and lectures and examinations for solicitors considerably antedate lectures and examinations for barristers.

In the United States. In America, as elsewhere, legal education was once obtained exclusively in lawyers' offices. Professorships entitled professorships of law, but devoted, it would seem, to presenting popular and not technical views of law to undergraduate college students and to the general public, were founded rather early, e.g. at William and Mary College in 1779, at the College of Philadelphia in 1790, at Columbia College in 1794, and at Harvard College in 1815 under the will of a testator who died in 1781. It is not clear when lectures were delivered under the first of these professorships by its earliest incumbent, Chancellor Wythe. The professorship at Philadelphia resulted in a course of lectures by Justice James Wilson, in 1790-91. The professorship at Columbia was twice held by Chancellor Kent, first from 1793 to 1795, and secondly from 1823 to 1826; and the work of Kent's second holding of the professorship was of a technical nature and produced the *Commentaries on American Law.* The Harvard professorship, called the Royall, was first held by Isaac Parker.

The earliest class-room instruction in technical law was furnished not at the colleges named, but in the famous private law school founded at Litchfield, Conn., by Tapping Reeve and maintained until 1833. This institution, though unincorporated, was thoroughly organized, having a course of fourteen months, pursuing the lecture system, conducting examinations and moot-courts, and attracting in some years as many as fifty students from all parts of the United States. Thus in the case of Litchfield it is clear that there was a law school, whereas in some other cases it is difficult to say whether there was a law school or simply an ordinary law office paying extraordinary attention to law students. The Harvard Law School dates from 1817, when there were two professors and when students who had completed their general education began to come to Harvard for professional instruction; but the Harvard Law School was not conspicuous until 1829, when Justice Story became Dane professor of law. There was a private law school in 1821 at Needham, Va.; and that, though it lasted but a short time, it was carefully managed is indicated by Taylor's *Journal of the Law School.* There was a private law school at Northampton, Mass., in 1823; and this school ceased in 1829, when one of its instructors became Royall professor at Harvard. The Yale Law School dates from 1824, being apparently an outgrowth of a private school. There was a private law school at Winchester, Va., in 1826, and during its short existence it produced Tucker's *Commentaries on the Laws of Virginia.* The law school of the University of Virginia was opened in 1826. The Cincinnati Law School was opened in 1833.

There has been a steady growth of law schools in number and in attendance; and in recent years this growth has been so emphatic as to prove that the law schools are now recognized as the only places for obtaining adequate preparation. In 1890-91 there were 54 law schools, with 406 instructors and 5252 students. In 1900-01 there were 100 law schools, with 1106 instructors and 13,642 students. The numerical advances in these ten years were accompanied by other changes, most of them unquestionably changes for the better. The requirements for admission have been increased, so that now half of the schools require at least a high-school education, and three or four require a degree in arts or in science. The law course has been lengthened, on the average, about one year, so that now rather more than half of the schools offer a course of three years. There has been a tendency to change the method of study from the lecture and text-book systems to the case system, which was introduced at Harvard by Professor Langdell in 1870, and which gained a foothold at the Albany Law School in 1889, and at the State University of Iowa and Columbia University in 1890.

There is difference of opinion as to the merits of the three systems of legal teaching—or, better, of legal study. Under the lecture system the student first derives his knowledge at the lecture and from the lecturer; and the student very probably takes notes and ultimately answers questions as to his understanding of the instruction given. Under the text-book system the student primarily derives his knowledge at his own room and from the statements made by text-writers; and he goes to the lecture-room to be questioned on his recollection and understanding of the statements in the text-books, and to receive more light from the instructor. Under the case system the student primarily derives his knowledge of law at his own room and through his own analysis of select reported cases; and after extracting from these cases the propositions of law necessarily involved in the decisions—the *rationes decidendi*—he goes to the lecture-room to state and discuss these cases and to participate in the solution of hypothetical problems based upon them. Under each system there may be statements of law by the instructor, reading text-books, study of reported cases, and discussion of problems; but, notwithstanding the possibility that each system may be so treated as to seem like some other, and notwithstanding the personal peculiarities which cause each instructor to pursue to some extent a method of his own, the distinction between the several systems is in practice readily drawn, and each law school is commonly known, according to the system to which it is principally devoted, as a lecture school, a text-book school, or a case school, although some of them attempt to combine systems and thus are rather difficult of classification. The 100 schools in existence in 1900-01 appear to have been divisible thus: lecture schools, 4; text-book schools, 82; case schools, 14.

The condition of the 100 schools existing in 1900-01 is further indicated by the following figures. The schools connected with universities numbered 71. There were 25 evening schools; and there were 5 with separate evening and day departments, the remaining 70 having day departments exclusively, although many gave all lectures either before or after the usual hours of legal business. The academic year generally lasted between 30 and 40 weeks; but in three instances there was an academic year shorter than 30 weeks. The length of the course varied thus: one year, 7 schools; two years, 40; three years, 51; four years, 2, each of these two being an evening school unable to demand full work from its members. The schools with courses shorter than three years were almost exclusively in the South, Indiana, New York, and the northern part of the Pacific Coast. Of the 13,642 students, 2119 held degrees in arts or in science, and 3366 took the degree of LL.B. in 1901. The value of grounds and buildings was $1,875,000. The endowment funds amounted to $1,151,920. The income from endowments and from tuition was

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actual practice. The requirement of law
preparatory to admission to the examina-
in as many as 18 States three years, and
nany as 11 States two years. In about half
States there is also a requirement of a
chool education.

al education is a frequent subject of dis-
n at meetings of law societies. The Ameri-
r Association has a standing committee on
Education and Admission to the Bar, and
Section of Legal Education. In 1901 the
ation of American Law Schools was
d, holding meetings at the same time and
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LE GALLIENNE, le găl'ĭ-ĕn, RICHARD (1866—). An English journalist and man of letters, born in Liverpool, January 20, 1866. He was graduated from Liverpool College, and served articles to a firm of chartered accountants for seven years, when he abandoned business to devote himself to literature. For a few months (1889) he was private secretary to the actor Wilson Barrett. In 1891 he became literary critic for the *Star*, and soon joined also the staffs of the *Daily Chronicle* and the *Speaker*. Two years later he was involved with Robert Buchanan in a controversy on the question, "Is Christianity Played Out?" The outcome was the *Religion of a Literary Man* (1893). In 1899 he wrote *Rudyard Kipling*, an attack on Kipling's art and influence. The range and quality of his general criticism is well represented by *Retrospective Reviews* (2 vols., 1896); and a certain grace by *The Book-Bills of Narcissus* (1891), *Prose Fancies* (1st series, 1894; 2d series, 1896), and *Sleeping Beauty and Other Prose Fancies* (1900). In 1898 he visited the United States on a lecture tour, and afterwards took up his residence in New York. For a time he wrote articles for the New York *Journal*. Among his publications not cited above are: *My Lady's Sonnets* (privately printed, 1887); *Volumes in Folio* (1889); *English Poems* (1892); *Robert Louis Stevenson and Other Poems* (1895); *The Quest of the Golden Girl*, a novel (1896), an adaptation of the *Rubaiyat* of Omar Khayyam; *Young Lives* (1899); *Travels in England* (1900); *An Old Country House* (1902); *Mr. Sun and Mrs. Moon* (1902); *George Meredith, Some Characteristics* (1902).

LEGAL TENDER. In its broadest sense, an offer or attempt to perform a contract in accordance with the appropriate legal requirements. When thus used, the term includes an offer to perform by doing something, as well as an offer to perform by paying something. In the former case a legal tender, that is, an offer to perform the contract at the agreed time and place, as in the case of a sale and delivery of a chattel, discharges the person making the tender from all contract liability, although the other party declines the tender. In the same way a legal tender of the amount due on a mortgage or a pledge, even though it be rejected by the creditor, will operate to discharge the property from the lien of the mortgage or pledge.

A tender of payment, however, does not discharge the debtor. Its effect is to save the tenderer from paying interest thereafter, and from the costs of a suit for the debt. In order that a tender of payment be legal, it must be a proffer of money actually produced and accessible to the creditor, or the production must be waived by him; the exact amount due must be offered or a sum tendered from which the creditor can take the exact amount without making change, and it must be unconditional.

The term is also used to denote the kind of money that is legally tenderable in the payment of debts. This is regulated with considerable minuteness by modern statutes. In Great Britain Bank of England notes are a legal tender for any sum above £5. Gold coins of the Royal Mint, unless diminished in weight below the statutory standard, are a legal tender for a payment of any amount; its silver coins for an amount not exceeding forty shillings; its bronze coins for an amount not exceeding one shilling. The Crown, with the advice of the Privy Council, may by proclamation declare foreign or colonial coins legal tender. In this country, under the Federal Constitution and statutes, the various gold coins of the National Mint, the notes of the United States, ordinarily called greenbacks, and a specified class of United States Treasury notes are a legal tender for debts of any amount. Silver dollars are a legal tender "for all debts, except where otherwise expressly stipulated in the contract;" while the other silver coins (the half-dollar, quarter-dollar, and dime) are a legal tender for an amount not exceeding ten dollars. Minor coins (the five-cent piece and the cent) are tenderable for an amount not exceeding twenty-five cents. Consult: 3 and 4 William IV. ch. 98, § 6; The Coinage Act, 1870, 33 and 34 Vict., ch. 10; United States Constitution, Art. 1, § 10; United States Revised Statutes, §§ 3584-3590, as amended; also the authorities referred to under Contract.

LEGAL-TENDER CASES. A series of cases before the Supreme Court of the United States involving the question whether certain acts of Congress, declaring the notes of the United States lawful money and a legal tender in payment of all debts public and private within the United States, except duties on imports and interest on the public debt, were constitutional. The first case, which brought the question squarely before the court, was Hepburn *v.* Griswold (8 Wallace, 603), a case in which the Court of Errors of Kentucky had held the acts of Congress above mentioned unconstitutional. It was first argued at the December term, 1867, reargued at the December term, 1868, and decided November 27, 1869, by a divided court. Chief Justice Chase and Associate Justices Nelson, Clifford, Field, and Grier were for the affirmance of the decision of the court below, while Justices Miller, Swayne, and Davis dissented. In April, 1869, an act was passed increasing the number of associate justices of the Supreme Court from seven to eight. Early in 1870 Justice Grier resigned, and Justices Bradley and Strong were appointed to the vacancies. After this reconstruction of the court, a motion was made for the reargument of Hepburn *v.* Griswold, which was granted by a vote of five to four, and the constitutional question was again considered and decided in May, 1871. Again was the court divided, but this time a majority, consisting of Justices Miller, Swayne, Davis, Bradley, and Strong, upheld the constitutionality of the act, while Chief Justice Chase and Justices Nelson, Clifford, and Field dissented. (Legal-Tender Cases, 12 Wallace, 457.)

All of the judges agreed that Congress had the power to direct issues of paper currency. The difference of opinion related solely to its power to make such currency a legal tender, especially for existing debts. The majority in Hepburn *v.* Griswold, who were the minority in the later cases, held that this power was neither specifically granted by the Constitution, nor was it necessary to the accomplishment of any granted power. Moreover, they deemed the statutes unconstitutional because they impaired the obligation of contracts and amounted to a taking of private property for public use without compensation. It was admitted by the minority in Hepburn *v.* Griswold, and the majority in the later cases, that the laws did impair the obligation of contracts made before their passage, but it was said, "While the Constitution forbids States to pass such laws, it does not forbid Congress." The Fifth Amendment, which forbids taking private property for public use without just compensation or due process of law, it was declared, had always been understood as referring only to a direct appropriation, and not to consequential injuries resulting from the exercise of lawful power. And, finally, it was held that the statutes were passed in the proper exercise of the power to borrow money and maintain the army and navy in time of war.

In 1878 Congress directed that the legal-tender notes of the United States which were redeemed, or received into the Treasury from any source, should be reissued and kept in circulation. As the final decision in the legal-tender cases above referred to had been rested in part upon the necessity of the earlier legislation as a war measure, the validity of the act of 1878 was assailed with much confidence. However, with but a single dissent (that of Justice Field), the court held that Congress has power to make United States notes a legal tender in the payment of private debts in time of peace as well as in time of war. "Congress," said the court, "has the power to issue the obligations of the United States in such form, and to impress upon them such qualities as currency for the purchase of merchandise and the payment of debts as accord with the usage of sovereign governments. The power, as incident to the power of borrowing money, and issuing bills or notes of the Government for money borrowed, of impressing upon those bills or notes the quality of being a legal tender for the payment of private debts, was a power universally understood to belong to sovereignty in Europe and America at the time of the framing and adoption of the Constitution of the United States. The governments of Europe, acting through the monarch or the legislature, according to the distribution of powers under their respective constitutions, had and have as sovereign a power of issuing paper money as of stamping coin." This decision has closed all judicial discussion, and declares the rule of law upon this point. Whether a national paper currency shall be a legal tender is now a question for the political forum only. Consult: *Legal Tender Case, Juilliard* v. *Greenman* (110 U. S., 421, 1884); Thayer, "Legal Tender," in *Harvard Law Review* (1887); Bancroft, *A Plea for the Constitution* (New York, 1886); Miller, *Lectures on the Constitution of the United States* (New York, 1891).

LEGARÉ, le-grē′, Hugh Swinton (1797-1843). An American jurist and statesman, born in Charleston, S. C., of Huguenot stock, January 2, 1797. He died in Boston, Mass., June 2, 1843. Though delicate, he was well educated at South Carolina College; then studied law for three years, visited Edinburgh, where he completed his education, and traveled on the Continent. Returning home, he devoted himself to planting for a time, was soon elected to the Legislature, and then began to practice law in Charleston. He was elected to the Legislature once more (1824-30), and was afterwards made Attorney-General of the State, being at the same time editor of the *Southern Review*, which he helped found (1828-32), and to which he contributed learned articles. During the Nullification crisis he opposed extreme measures, although he was always in favor of States rights. From 1832 to 1838 he served as chargé d'affaires at Brussels. On his return he was elected to Congress, where he served one term, winning reputation as a debater on the pro-slavery side. Opposition to the sub-treasury scheme caused his defeat and drew him over to the Whigs. In 1841 he became Attorney-General under Tyler, and served until his sudden death, having also conducted the State Department after the retirement of Webster. He was a man of profound learning, especially in the civil law, and his essays on literary and general topics were equal to anything of the kind produced at the time in America. His writings were edited by his sister in two volumes (1846).

LEGATE (Lat. *legatus*, ambassador, deputy, lieutenant, governor, from *legare*, to send on a commission, bequeath). A title most commonly applied to the diplomatic and other representatives of the Pope outside of Rome. Legates are of three kinds: (1) *Legati a latere* (from the side); (2) commissioners or nuncios, *legati missi, nuntii apostolici*, with a minor class of *internuntii;* (3) legates by virtue of their office, *legati nati*. The dignity of a legate *a latere* has been confined to cardinals since the decree of Innocent IV. (1243-54) on the subject. Legates *a latere* are either ordinary or extraordinary; the first commonly governed provinces within the Papal States; the second are commissioned to visit foreign courts for special purposes, such as a negotiation for a peace or arrangements for a general council. The *legati missi* or nuncios correspond to the ambassadors or ministers maintained by secular States at foreign capitals. The dignity and jurisdiction of a *legatus natus* is permanently attached to a metropolitan see by Papal concession; the Archbishop of Canterbury held this position up to the Reformation, and Cardinal Richelieu attempted to secure it for himself. Legates formerly exercised an immediate jurisdiction as representing the Holy See; hence frequent conflicts with local episcopal authority arose. To quiet these conflicts, the Council of Trent (Sess. xxiv. cap. 20) decreed that legates were not to presume on the strength of any faculties whatsoever to impede the bishops in matrimonial causes or in those of criminous clerks, nor to take proceedings unless recourse had been had to the bishop and he had neglected to act. An authority somewhat similar to the ancient legatine jurisdiction was granted by Pope Leo XIII. to a permanent apostolic delegate for the United States and to one for Canada; and similar officials have been sent also to the Philippines and to Cuba to adjudicate the questions growing out of the Spanish-American War of 1898.

LEGATION. A diplomatic minister or envoy and his suite, or persons associated with him in his official capacity. The term is also employed to designate his official residence and inclosure. The word 'legation' is also sometimes employed to denote the territorial jurisdiction or district of a diplomatic officer. See DIPLOMACY; MINISTER; INVIOLABILITY.

LEGATO, lȧ-gä'tô (It., tied). In music, a direction that the notes are to be played as if bound or tied together, or in such a manner that the one note flows into the following one. Legato may refer to the character of the whole movement or merely to a certain phrase.

LEGAZPE, lȧ-gäth'pȧ, or **LEGASPI**, lȧ-gäs'pê, MIGUEL LOPEZ (c. 1510-72). A Spanish soldier and conqueror of the Philippine Islands. He was born at Zumarraga (Guipúzcoa), and went to Mexico. Having distinguished himself as chief secretary of the city and Government of Mexico, he was put in charge of the expedition sent out by the Viceroy, Velasco, in 1564, to conquer the Philippines. With a convoy of four ships Legazpe arrived there in 1565, and sent out parties to explore and occupy the country. The first settlement was made at San Miguel on the island of Zebu (May, 1565), and after completing the conquest of Luzon he founded the city of Manila (May, 1571). The islands were annexed with little bloodshed, thanks, in a great measure, to the humane nature of Legazpe himself. They received from him the name of Islas Filipinas, in honor of Philip II.

LEGEND (OF. *legende*, Fr. *légende*, from ML. *legenda*, story, from Lat. *legenda*, nom. pl. neu. of *legendus*, to be read, gerundive of *legere*, to read). In the technical language of folklore, a narrative relating to a sacred person or locality, and connected with religious belief or worship. Legends were primarily lives of Christian saints, because these were included in the selections (*legenda*) to be read in public worship. (See LESSON.) In the early Church, on the anniversary of a martyr, it appears to have been usual to read the story of his passion. Later, readings from lives of the saints formed a part of monastic worship (office of nocturns). Different churches, according to local ideas and stories, enlarged the lives of their respective saints, so that in time it became necessary to gather and coördinate the material. As a result of this process, toward the end of the thirteenth century, Jacobus de Voragine (James of Varagium) composed the famous *Legenda Aurea*, or Golden Legend. The term legend there denoted the entire work, but subsequently it came to designate the story of any particular saint. The tendency of such narratives was toward a presentation continually more fanciful. Legends, at first brief and simple, became long and imaginative. Consequently, they came to be regarded with suspicion, so that the word was finally taken to signify any narrative professing to be historical, but in reality of a traditional and imaginative character.

In regard to origins, the general principle is that a story primarily historical (though from the first often also semi-fabulous) becomes, in course of time, more and more imaginative through absorption of material from current literature or folk-lore, in such a manner that the actual occurrence is resolved into the popular ideal. This process has by no means ceased; as examples may be cited the accounts of modern Russian Jewish rabbis, to whom are popularly ascribed wonderful qualities bestowed after the pattern of Talmudic authors. Thus the personality of the founder of the fanatical sect of the

Chasidim, Baal Shem (Israel Besht), who lived in the eighteenth century, has become obscured in the accounts of his admirers, who represent him as a miracle-worker, predicted by prophets, and encompassed with an aureole; the man himself seems to have been a quiet mystic. The unhistorical elements which have been incorporated in legends may be referred to several categories. For instance, a great influence has been exercised by the tendency to repeat types and events of the Old and New Testaments. A second class of legendary incidents arises from a confusion of fact and metaphor; for example, inasmuch as the name Christopher signifies Christ-Bearer, the saint was represented as a giant carrying on his shoulders the infant Jesus. Yet a third class represents the survival of ideas and beliefs belonging to more ancient faiths, as in the (relatively late) story of the rescue by Saint George of the daughter of a king of Libya, which preserves the tale of the dragon-slayer Perseus.

A word must be said on the literary use of Christian legends. During the Middle Ages their versification continued to be a favorite form of poetic composition. Rhymed accounts of Saints Eulalia and Alexis belong to the principal monuments of old French literature. In Germany, legends were poetically treated in the thirteenth century by Hartmann von Aue, Rudolf von Ems, and Konrad von Würzburg. The Renaissance and the Protestant Reformation put an end to this literary interest, which, however, was renewed during the romantic revival of the eighteenth and the early part of the nineteenth century. Legend was then considered less as veritable history than as an expression of sentiment and folk-thought.

From a primal application to Christian hagiology, the legend has been extended to include histories belonging to other faiths. It is in the nature of things that every people should possess a multitude of traditional narratives, taken to be historical, and explanatory of their usages and beliefs. Mohammedan saints also have their legends, which have not, however, found a place in the authorized worship. In dealing with the religion of ancient Greece, it is usual to distinguish legends of heroes from myths concerning the gods, as if the former had more of an historical element, while the latter were more purely imaginative; but this distinction is by no means clear or well defined. Among American Indians the name of legend has been given to sacred histories which relate to personages honored in the cult, and which frequently supply information respecting the origin and migrations of the tribe. It is probable that similar legends, of a quasi-historical character, constitute a universal property of races in a primitive condition of culture.

Bibliography. For the manner in which legends became part of public worship, as well as for an account of Old English legends, consult: Horstmann, *Altenglische Legenden* (Heilbronn, 1881); for remarks on classification and origin of legends, Maury, *Croyances et légendes du moyen âge* (Paris, 1896); for literary use of legends in Germany, Bülow, *Zur Nachfolge Christi* (Leipzig, 1859); for legends of Mohammedans, Weil, *Biblische Legenden der Muselmänner* (Frankfort, 1845); for American-Indian legends, Matthews, "Navaho Legends Collected and Translated," in *Memoirs of the American Folk-Lore Society*, vol. v. (Boston, 1897). For the immense literature of Christian lives of the saints and legends of the Virgin, consult the authorities referred to under the corresponding titles. The *Legenda Aurea* of Jacobus de Voragine was printed in English translation by Caxton (1484); recently reprinted by Ellis (London, 1900); a French translation by Roze (Paris, 1902). See Martyrology; Mythology; Saint.

LEGEND. In music, the title of compositions that are based on some legend of saints. But to-day the title is frequently given by composers to shorter instrumental compositions of an elegiac character which have no underlying programme whatever.

LÉGENDE DES SIÈCLES, lā'zhäNd' dā sē-ā'kl', La (Fr., The Legend of the Centuries). A collection of brilliant narrative poems by Victor Hugo (1859), depicting episodes from different ages of the world's history.

LEGEND OF GOOD WOMEN. A poem by Chaucer, written probably in 1385. He intended to give the stories of nineteen celebrated women of antiquity, but finished only nine. The plan was taken from Boccaccio's *De Claris Mulieribus*, but Chaucer evidently drew also from Ovid, Livy, Statius, Vergil, and a Latin translation of Plutarch's *Lives*. Traces of Dante and Guido delle Colonne can be seen. Tennyson's *Dream of Fair Women* was modeled on this poem.

LEGEND OF JUBAL, The. The title of a collection of poems by George Eliot (1874).

LEGEND OF MONTROSE, A. A novel by Sir Walter Scott (1819).

LEGEND OF SLEEPY HOLLOW, The. A tale by Washington Irving, in the *Sketch Book*. The tradition of the Headless Horseman, connected with the spot, is used by a rival for the hand of Katrina van Tassel to put a stop to the courtship of Ichabod Crane, the awkward schoolmaster. Ichabod's wild ride in his fruitless attempt to escape his ghostly companion ends at the bridge, when the headless rider rises on his horse and hurls his head at the luckless schoolmaster, who falls to the ground and is not seen again. The discovery of a shattered pumpkin on the spot of the encounter is left unexplained, but Katrina's successful suitor laughs knowingly when the subject is mentioned.

LEGENDRE, le-zhäN'dr', Adrien Marie (1752-1833). A French mathematician, born in Paris. He early became professor of mathematics in the military school, and later in the normal school at Paris. He was a member of the Academy and of the Bureau of Longitudes, and in 1816 was appointed examiner for admission to the Ecole Polytechnique. In 1824, in an election at the Academy, because he did not vote for the candidate of the Government, he was deprived of his pension, and he died in poverty. Legendre was one of the leaders in introducing the metric system, and was associated with Prony in preparing the great centesimal trigonometric tables. He contributed extensively to the theory of attraction (from 1783), and introduced into the discussion of the attraction of spheroids the special cases of Laplace's coefficients which bear his name. He also wrote important memoirs (1787-88) on geodesy, introducing a method of treating the spherical triangle as plane, provided certain corrections are made with respect to the angles. The method of least squares was introduced in his *Nouvelles méthodes* mentioned below, although Gauss had already (1795) used it. The celebrated law of quadratic reciprocity (see Number), which Gauss called 'the gem of arithmetic,' appeared in a memoir of 1785, but the first proof was given in his *Théorie des nombres.* The most important of Legendre's works is the *Traité des fonctions elliptiques,* upon which he worked for forty years. It is a tribute to his generosity that just as his work was appearing the labors of Abel and Jacobi became known, and were at once recognized by him as superior to his own. He even went so far as to embody them, with due credit, in his last volume. (See Functions.) The work which had the greatest popularity, and which was a classic for a century, was his *Eléments de géométrie* (1794, 15th ed. 1881; Ger. trans. by Crelle, 6th ed. 1873; Eng. trans. 1860). The later editions of this work contain his proof of the irrationality of π and π^2. His other works are: *Essai sur la théorie des nombres* (1798; 4th ed. 1900; Ger. trans. by Maser, 1886); *Nouvelle théorie des parallèles* (1803); *Nouvelles méthodes pour la détermination des orbites des comètes* (1805); *Exercices de calcul intégral* (1807; new ed., 3 vols., 1819); *Traité des fonctions elliptiques et intégrales Eulériennes* (3 vols., 1826-32).

LEGER, le-zhâ′, Louis Paul Marie (1843—). A French writer and linguist, born at Toulouse. He was educated at the Lycée Louis-le-Grand, and early turned his attention to the study of Slavic languages. In 1864 he went to Bohemia, and this visit was followed by many others to that country, Hungary, Poland, and especially to Russia. After teaching at the Sorbonne, he was at the Ecole Spéciale des Langues Orientales, where he became full professor in 1877. In 1885 he was appointed professor of the Slavic languages and literatures at the College of France. Besides his contributions to the important journals of the day, he wrote such works as *Etudes slaves* (1875); *Nouvelles études slaves* (1880; second series 1886); *Contes slaves* (1882); *Chronique dite de Nestor* (1884); *La Save, le Danube et le Balkan* (1884); *La Bulgarie* (1885); *Histoire de l'Autriche-Hongrie* (1878 and 1889); *Russes et Slaves* (1890); and *La littérature russe* (1892).

LEGERDEMAIN, lĕj′ẽr-dē-mān′ (Fr., sleight of hand). The art of performing tricks of deception—in the narrower sense, with the hands alone; broadly, with any aid of physical appliances.

The arts of magic, seemingly as ancient as human intelligence, are of two general types: (1) Forms such as necromancy, divination, sorcery or enchantment, perhaps astrology, in which the magician works by means of spells, incantations, or of some occult science supposed to give him knowledge of superhuman agencies and power to direct them; (2) legerdemain and jugglery in which the magician displays his own skill at wonder-working. Ordinarily, among primitive peoples, the magician—witch-doctor, medicine man, or what not—is himself deceived by the usages of magic of the first type, receiving them as mysteries of his cult and implicitly relying upon their efficacy. Magic of the second type, however, is used and understood by him merely as a means of impressing his more ignorant fellow-men with a sense of his power; it is conscious deception. This distinction is significant in the history of magic and is maintained even in modern civilization; for, although many forms of the first type of magic are imitated by tricks of legerdemain, notoriously in the spiritualistic séance, there still persists credulity in occultism in connection with the frankest recognition of the natural causes of the deceptions of jugglery.

Legerdemain and jugglery are sometimes grouped under the title 'natural magic,' probably on the analogy of 'natural philosophy,' since so many of their deceptions are applications of simple principles of physics and chemistry; but the two terms are not precisely synonymous. Jugglery is the broader term, denoting not only tricks of deception, but performances with paraphernalia demanding great skill and dexterity, in which no deception is intended. Legerdemain, however, is confined simply to tricks of deception. The diverse development is perhaps illustrated in the jugglers of India and those of Japan. The performances of the former so often cited, such as the mango trick, the basket trick, and the snake-charming trick, are properly legerdemain, depending for their deception upon some type of substitution; whereas the feats of the Japanese are very largely feats of equilibration, as the balancing of objects upon various parts of the body, demanding great skill, but not as a rule designed to deceive.

In legerdemain proper the essential feature is generally an act of substitution, as when, for example, the performer seems to discover eggs, money, and the like objects in places previously perceived to be empty. Often the substitution requires for its efficiency elaborate mechanical devices, though the most skillful thaumaturgists prefer to rely upon their own manual dexterity. The power of deceiving is almost invariably due to power of diverting the percipient's attention at a crucial moment—the moment of the substitution. In this even more than in celerity of movement lies the essence of the art. The psychological principles underlying the deception rest wholly upon the laws of attention. In proportion as attention is intensified, its scope becomes narrowed; as, for example, concentrated inspection of any object renders stimuli affecting the marginal regions of the field of vision practically invisible. It is, accordingly, the first duty of the performer to centre the percipient's attention as strongly as possible upon the object-matter of the trick to be performed. Succeeding in this, he gains a practical control over the percipient's range of vision and has little difficulty in diverting it at the crucial moment. It may thus be said that the keenest scrutiny is the likeliest to fall victim to the trick.

The part of the legerdemainist himself, however, is one of great difficulty; for he must be able to discoördinate his actions and diversify his attention to a degree only attainable by long practice. His hands and eyes must be trained to work apart—the hands performing the substitution, eyes and bodily pose misleading the percipient. Similarly, his attention must comprehend and direct many diverse details at once.

The origin of thaumaturgy is of remote antiquity. Savages the world over have developed cults and mysteries which transmit, with other lore, tricks of legerdemain from generation to generation. The Navaho Indians perform a trick with the cactus almost identical with the mango trick of India; and nearly all of the simpler performances are known to widely separated peoples. The wonder-workers of Egypt and Mesopotamia were anciently famous, and many of the miracles recorded indicate that the Roman priests utilized principles of hydrostatics and optics for the production of illusions. Jugglers were known among the Anglo-Saxons, but appear to have attained no great proficiency. Indeed, it was only with Robert Houdin (1805-71) that legerdemain became a matter of science. Houdin built many clever contrivances and wrote several books on the subject, never claiming to be a wonder-worker in miraculous sense, but only a clever manipulator. Since his day others—notably the Herrmanns—have advanced the art to a degree far in advance of any previously attained. On the other hand, many impostors have utilized legerdemain to produce 'materializations' of spirits, clairvoyant readings, slate-writings, and the like. Hypnotism has also been widely used by professional exhibitors—often fraudulently; and very many tricks which are merely exhibitions of known natural principles or feats of apparent strength, as the supporting of weights on the pelvic arch, have been passed as thaumaturgic phenomena.

Consult: Pousin, *Nouvelle magie blanche dévoilée* (Paris, 1853-54); *Sorcellerie ancienne et moderne expliquée* (1858); Robert Houdin, *Secrets de la prestidigitation et de la magie* (Paris, 1868); Brewster, *Natural Magic* (London, 1851); Hopkins, *Magic* (New York, 1898).

LEGER-LINES (OF. *legier*, *leger*, Fr. *léger*, It. *leggiero*, light, from Lat. *levis*, light). In music, the name of the short lines above or below the staff, which are used to express those notes which lie beyond the five lines of the staff. The spaces between these auxiliary lines are called leger-spaces.

LEGGE, JAMES (1815-97). A Scottish missionary and Sinologist; born at Huntley, Aberdeenshire. He was educated at the Aberdeen Grammar School and Aberdeen University, where he graduated in 1835, and proceeded to London, entering Highbury Theological School. Having been ordained, he was sent in 1839 by the London Missionary Society to the East as a missionary to the Chinese. Until 1842 he was stationed at Malacca, but when Hong Kong became a British colony in that year he moved thither. From the first he was an earnest and industrious student of Chinese, giving his attention chiefly to the Chinese classics. His missionary labors, however, were not neglected, and during his years of service in that colony he baptized no fewer than 600 converts, besides acting as the pastor of the Union Church. In 1876 he became professor of Chinese language and literature at Oxford University, a chair which had been founded especially for him.

His greatest and most lasting work was his translation of the Chinese classics. Between 1861 and 1873 he issued at Hong Kong eight volumes, containing the Chinese text, translation, and most elaborate and learned Prolegomena, *The Four Books*, containing "The Analects of Confucius," "The Great Learning," "The Doctrine of the Mean," and *Mencius;* the *Shu King* or "Book of History;" the *Shih King* or "Book of Poetry;" and the *Ch'un Ch'un*, or "Spring and Autumn" (the only work ever written by Confucius), with Tso-chuan's *Commentary*. The remaining books of the series—the *Yih King*, or "Book of Changes;" the *Li Ki*, or "Book of Rites;" the *Hiao King*, or "Book of Filial Piety"—were afterwards published at Oxford, without the Chinese text, and are found in the "Sacred Books of the East" series, edited by Max Müller. He also prepared and issued for the use of general readers the *Four Books* without the Chinese text, and the critical notes. In 1886 he also prepared and issued the text and translation of *A Record of Buddhistic Kingdoms* by the Chinese pilgrim Fa-Lien (A.D. 399-414), with an introduction and critical notes; and in 1891 in the "Sacred Books of the East" series, *The Texts of Taoism* (the Tao-teh-king, Chwang-tse, and the Kan-ying Pien) in two volumes. He also published a volume on *The Religions of China* (1881). He wrote *Notions of the Chinese Concerning God and Spirits*, and *Confucianism in Relation to Christianity* (1877).

LEG'GETT, MORTIMER DORMER (1831-96). An American soldier, born in Ithaca, N. Y. He early removed to Ohio, and there studied at first medicine and afterwards law, which last he practiced with success. From 1855 to 1858 he was professor of pleading and practice in the Ohio College of Law, and in 1858 became superintendent of schools at Zanesville. At the outbreak of the Civil War he helped raise the 78th Ohio Volunteer Infantry, of which, in January, 1862, he was commissioned colonel, and which he commanded at Fort Donelson, Shiloh, and Corinth. In November, 1862, he was appointed brigadier-general of volunteers, and participated in the Vicksburg campaign, during which he was wounded. Later he commanded the Third Division of the Seventh Army Corps on Sherman's march to the sea. He was brevetted major-general of volunteers in July, 1864, and was commissioned major-general a year later. He was appointed United States Commissioner of Patents in 1871, and held that position until 1881, when he resigned to resume his private practice.

LEGGETT, WILLIAM (1802-39). An American author, born in New York City. He was educated at Georgetown College, D. C., entered the navy in 1822 as midshipman, and served until 1826. During this time he had written a volume of poems, entitled *Leisure Hours at Sea*, and after resigning from the navy he commenced his literary work as editor of the *Critic*, a weekly journal, which was afterwards united with the New York *Mirror*. Several of his articles which appeared in the *Mirror* and other magazines he subsequently published in a volume with the title of *Tales by a Country Schoolmaster*, which was followed by *Sketches at Sea*. In 1829 he became one of the editors of the *Evening Post*, and in connection with this work attracted attention by vigorously denouncing those who mobbed the abolitionists in 1835, and by earnestly defending the right of free discussion. Retiring from the *Post* in 1836, he established the *Plaindealer*. He was appointed by President Van Buren diplomatic agent to Guatemala, but died suddenly at New Rochelle while preparing for his departure. He had many devoted friends, among whom was William C. Bryant, who wrote a highly eulogistic poetical tribute to his memory.

LEG'HORN (It. *Livorno*, ML. *Liburnum*, Lat. *Portus Herculis Liburni*, *Portus Labronis*). A city of Italy in Tuscany, on the Mediterranean, capital of the Province of Leghorn, 113 miles by rail southeast of Genoa, 208 miles northwest of Rome, 62 miles west of Florence (Map: Italy, E 4). In 1551 it had only 749 inhabitants; but now the only Italian cities surpassing or rivaling it commercially are Genoa and Naples. The city has broad, straight, well-paved streets, large public squares, and splendid boulevards. The main street, on which are all the principal shops, is the Via Vittorio Emanuele, running east from the harbor and crossing the broad Vittorio Emanuele Square, in which is an equestrian statue of King Victor Emmanuel by Rivalta. In Garibaldi Square is a monument to the great patriot; in Carlo Alberto Square are colossal statues of Ferdinand III. and Leopold II., the last Grand Dukes of Tuscany; in Cavour Square is a marble statue of the statesman; in Micheli Square a statue of Ferdinand I., Grand Duke of Tuscany. Besides the seventeenth-century cathedral there are twenty-three churches (among them Evangelical, English, Greek, Armenian, Waldensian, Scottish), and a handsome synagogue founded in 1581. The most interesting public building is the royal castle. There are several good hotels and a number of sea-bathing establishments with cafés and terraces. Leghorn's popularity as a bathing resort is constantly growing, and during the season, from July 15th to September 15th, many of the villas along the shore to the south are occupied by English and Americans. Electric cars connect the railway station with the bathing establishments and with the suburban summer resorts of Ardenza and Antignano. The new race-track near Ardenza is one of the best in Italy. Montenero, two and a half miles from Ardenza, is a resort for pilgrims, having an image of the Madonna much esteemed by sailors. The water-supply comes from the hills of Colognole, thirteen miles away, and is stored in an immense reservoir. Educational institutions are the Royal Marine Academy, the Royal Commercial Marine Institute, a lyceum, a gymnasium, and a public library with 60,000 volumes. Charitable institutions are two pest-houses, a great hospital, founded in 1622, an asylum for foundlings, and an orphan asylum. Leghorn is the seat of a bishop, and of an American and other foreign consuls.

The inner harbor (Porto Vecchio or Mediceo) admits vessels of small draught only; the outer harbor (Porto Nuovo), added in 1854, is protected by a semicircular mole five-eighths of a mile long, with lighthouses at both ends. From them is to be had a comprehensive view of the city and of the islands of Elba, Gorgona, and Capraja. On a rocky island in the outer harbor is a lighthouse (Faro) erected in 1303. Numerous canals intersect the town, and a ship canal connects the harbor with the Arno, which flows into the Mediterranean nine miles north. Leghorn has regular steamship communication with Genoa, Corsica, Malta, the Levant, Marseilles, and Hamburg. The tonnage of vessels entered in 1885 and 1900 was 1,434,000 and 1,839,954 respectively. The principal exports are cotton, wool, and raw silk to the Levant; other exports are olive oil, wine, candied fruit, borax and boracic acid, tartar, soap, hemp, hides, quicksilver, furniture, and marble. The principal imports are grain and petroleum from Russia via the Black Sea; other imports are spirits, sugar, tobacco, cotton, wool, hides, and coal. The value of the exports and imports in 1900 was $9,700,000 and $16,000,000 respectively. The armored vessels of the Italian navy are built at the works of the Orlando Brothers. Among the manufactures are glass, porcelain, coral ornaments, and chemical products. There are iron-foundries. Population, in 1881 (commune), 97,615; in 1901, 98,321. Leghorn became important only after the decay of the neighboring city of Porto Risano, the harbor of which is now entirely filled up. It came into the possession of Florence in 1421, was fortified by Alessandro de' Medici, and was declared a free port (the first in the Mediterranean) by the Grand Duke Cosimo I. Consult Vivoli, *Annali di Livorni* (Leghorn, 4 vols., 1842).

LEGION (Lat. *legio*, properly a 'levy,' 'choice,' from *legere*, 'to choose,' 'select,' Gk. *λέγειν*, *legein*, to choose). The tactical unit of the Roman army. In early Rome, the army consisted *ipso facto* of all the citizens, i.e. patricians, capable of bearing arms. Thus it was an irregular force that could be summoned to combat in time of need by the chief. Romulus is said to have organized a force consisting of 3000 *milites*, or armed infantrymen, and 300 *celeres*, or horsemen (knights); these were furnished in equal numbers (one thousand *milites* and one hundred *celeres*) by each of the three tribes, Ramnes, Tities, and Luceres, into which the citizens were divided, and commanded severally by the *tribunus militum* and the *tribunus celerum*.

It was King Servius Tullius, however, according to the tradition of the ancients, who first organized the army on a substantial military basis. In accordance with the democratic reforms of the time, the warriors were not drawn exclusively from the patriciate; the lower classes also, or *proletarii*, were permitted to bear arms. The *iuniores*, or younger men, from seventeen to forty-six, formed the backbone of the army, and bore the brunt of actual fighting in the field; the *seniores*, elder men, from forty-six to sixty, defended the city, and took the field in times of pressing need. They fought in the form of the *phalanx*, or solid body, without any regular division into battalions, except on the basis of age and rank described above; a system that was maintained until the beginning of the fourth century B.C., when a new reform is said to have been organized by Camillus (B.C. 390). This new system had for its basis the *legio*, or army corps, two of which formed the *exercitus consularis*, or consular army. The legion was commanded by six *tribuni militum*, always members of the nobility, who took turns, by the day or the month, in the actual command. Legions were always enrolled for a single year's campaign, and dismissed at the end of the season. The warriors were compelled to furnish their own equipment, except that the *proletarii* were equipped by the State. With the gradual conquest of Italy, however, and the numerous wars with nations beyond the sea, this system of annual citizen soldiery became impossible, and war tended to become a profession.

The army, as organized on the legionary system of the Republic, was divided as follows: the legion consisted normally of 4200 infantry and 300 cavalry; the infantry body (aside from the *proletarii*) was divided into thirty maniples, and each maniple was subdivided into two centuries, or 'companies.' But there was also a division according to age and experience. Each legion had 1200 *hastati*, or younger men, forming the first line in battle, 1200 *principes*, men of riper years, and 600 *triarii*, or veterans; and this was the legion proper, as divided into maniples and centuries. They were armed with bronze helmets with plumes (*cassis*), cuirass (*lorica*), greaves (*ocreæ*), a long semi-cylindrical shield (*scutum*), and a short, pointed, double-edged sword (*gladius*). The *hastati* and *principes* carried also each two *pila*, or long, heavy javelins, while the *triarii* bore lighter lances. In addition to the above, each legion had 1200 *velites*, light-armed troops drawn from the *proletarii*, armed with leather helmet (*galea*), round shield (*parma*), and short sword (*gladius*). The 300 horsemen (*equites*) attached to the legion were divided into ten *turmæ* of thirty horse each, each *turma* under the command of three decurions. Each infantry maniple was captained by a centurion, and had its own standard, while the legion as a whole had its eagle (*aquila legionaria*). A new reform in army organization was due to Gaius Marius at the end of the second century B.C. The *census* or position according to social rank wholly ceased to be regarded. The Italian allies of Rome were admitted to the legions. The class of *velites* was abolished, and the cavalry was no longer made up exclusively of Roman *equites*. The army was now a permanent body, and twenty years was the usual term of service. An important change was effected also in the internal organization of the legion. Its tactical division was no longer the maniple, but the cohort (*cohors*). The three lines were assimilated, and the legion was divided into ten cohorts, each consisting of three maniples, or six centuries. At the same time the effective strength of the legion was increased, but during the civil wars the actual number of men varied with the exigencies and possibilities of the case. The normal strength of the cohort was soon raised to 600, making a legion of 6000 men, besides auxiliary troops and cavalry drawn from the barbarian subjects and allies of Rome. In battle, the legion was arranged in two lines of five cohorts each; but Cæsar altered the formation to three lines, of four, three, and three cohorts, respectively. The chief centurion of the *triarii*, or veterans, known as *primus pilus*, was the ranking officer of the legion, but the responsibility of command was vested in the *legatus legionis*, or lieutenant-general, while the six *tribuni militum* remained a sort of honorary staff of young nobles, who used this irresponsible form of military service as a first step in their public career, but were actually rather a nuisance in the army.

When the battle of Actium (B.C. 31) left Octavius in sole control of the Roman world, there were remnants of fifty legions under his command. In B.C. 27 he effected a thorough reorganization of the Roman armies, reducing the total number of legions to twenty-three, to which he added two new ones about B.C. 5. Under the Empire, when whole legions were annihilated in war, either they were newly recruited or the name was dropped. The number of legions, however, gradually increased. Claudius added a new one after his conquest of Britain; Nero created three more; Galba, one; and so on until under Septimius Severus there was a total of thirty-three legions, which remained the full number until the reign of Diocletian. Under the late Empire, the quota of men to the legion was reduced, but the number of legions was vastly increased. In the fourth century there were more than 175 legions in the field.

The legions of the Empire were distinguished by numbers and names, as *legio VIII Augusta*, *legio XII Fulminata*, *legio XV Apollinaris*. Titles were sometimes bestowed by the Emperors, as special marks of honor, as *pia* (loyal), *vindex* (avenging). Sometimes they were derived from the name of the reigning Emperor, as *Severiana*, *Antoniniana*, and often from the place of service, as *Italica*, *Macedonica*. On the legions of the Empire, consult Pfitzner, *Geschichte der römischen Kaiserlegionen* (Leipzig, 1881).

LEGION, Theban (Lat. *Legio Thebana*). A legion of Christians, said to have suffered martyrdom to a man under the Emperor Maximian (286-305). As the story goes there was a legion in the Roman army recruited in the Thebais, the region round Thebes in Egypt, led by Mauritius, and made up entirely of Christians. This legion the Emperor reviewed at Agaunum in Switzerland, and required to swear allegiance in the usual heathen manner. This they refused to do and were massacred to a man. This event, first recorded in writing in the fifth century, made so profound an impression that the name of the place was later changed into Saint Maurice and a Benedictine monastery built there: the commander became Saint Maurice, patron saint of Magdeburg and many other places; his lance became the ensign of the Burgundians, and his spear part of the investiture of the Burgundian kings. The arguments pro and con for this story are given in the *Acta Sanctorum* of the Bollandists under September 22d.

LEGION, The Thundering (Lat. *Legio Fulminata*). A legion of the Roman army. During Marcus Aurelius's war with the Marcomanni (A.D. 174), his army, according to the narrative, being shut up in a mountainous defile, was reduced to great straits by want of water; and when a body of Christian soldiers prayed to the God of the Christians, not only was rain sent seasonably to relieve their thirst, but this rain was turned upon the enemy in the shape of a fearful thunder-shower, under cover of which the Romans attacked and utterly routed them. The legion to which these soldiers belonged was thence, according to one of the narrators, called the Thundering Legion. This legend has been the subject of much controversy; and it is certain that the last-told circumstance at least is false, as the name 'Thundering Legion' existed long before the date of this story. There would appear, nevertheless, to have been some foundation for the story. The scene is represented on the column of Antoninus. The event is recorded by the pagan historian Dion Cassius (lxxi. 8), who attributes it to Egyptian sorcerers, and by Capitolinus and Themistius, the latter of whom ascribes it to the prayers of Aurelius himself. It is appealed to by the nearly contemporary Tertullian, in his *Apology* (c. 5), and is circumstantially related by Eusebius, by Jerome, and Orosius. It may be conjectured that the fact of one of the legions being called 'Thundering' may have led to the localizing of the story, and the ascribing of the name to this particular legion.

LEGION OF HONOR. A French order of merit founded by Napoleon in 1802 and organized two years later. The distinction was conferred for meritorious conduct in military or civil life. The order comprised in the beginning 3665 chevaliers, 450 officers, 300 commanders, 105 grand officers, and a grand master, the last office being vested in Napoleon himself. All members at their initiation were required to pledge their support to the defense of the State and of the liberties achieved by the Revolution. The order experienced many alterations with the successive changes of dynasties in France. Its present constitution dates from the year 1872, when it was reorganized into five classes —chevaliers, officers, commanders, grand officers, and grand crosses. Stipends ranging from 250 francs for a chevalier to 3000 francs in the case of a grand cross are attached to these dignities. In 1892 the order numbered 43,851 members of all classes, and by law of 1897 the maximum number of additional crosses to be distributed was fixed at 14,320. The emblem of the order is a five-rayed star of white enamel edged with gold, bearing on its obverse the image of the Republic with the inscription *République Française*, and on the reverse two flags with the motto *Honneur et Patrie.* It is surmounted by a wreath of oak and laurel and is suspended from a red ribbon. Originally the cross bore, instead of the emblem of the Republic, the portrait of Napoleon, and was surmounted by an Imperial crown. The order is also conferred on foreigners, and in some cases upon women.

LEGISLATION. The creation, alteration, or repeal of law, by the act of the sovereign. In primitive society legislation as a source of law had little or no place, custom and usage supplying whatever rules were found to be necessary for the regulation of the common affairs of the community. In such a society the deficiencies of customary law were often supplied by commands issued by the King or chief, sometimes with the assent of his warriors or nobles. In some communities this power became vested in a special class of learned persons, as, for example, the Druids in Britain and the Brehons in Ireland. The disinclination to innovate upon the customary law, however, and the comparatively few legislative needs of a primitive society made the enactment of new law a rare occurrence. It is doubtful if the great ancient codes contained much new law, for it would have been a rash act for a lawgiver to presume to innovate upon the immemorial customs of the race. But with the growth of a more highly developed society and the advance of civilization new sources of law made their appearance. Legislation, says Sir Henry Maine, is one of the three agencies by which law is brought into harmony with society, the other two being legal fiction and equity. Bentham, however, using the term in a wider sense, includes both legal fiction and equity under the head of legislation, on the ground that all three processes involve the making of new law, the difference being only one of method. The term is more commonly employed in the special sense of the enactment or amendment of law by the direct action of the sovereign, or of a special organ of the State to which the legislative power is committed. As thus employed, it excludes the process of adjudication, which is, however disguised, one of the most prolific sources of law. Indeed, the complete separation of the two processes is a device of modern society, legislative and judicial functions not being distinguished in the earlier stages of legal development.

Legislation played an important rôle in the legal development of the Greek republics of antiquity, especially in the popular assemblies of Athens and Sparta, but it attained its highest development in the republican era of Rome. Here its chief organs were the *comitia*, or popular assembly of free citizens, and the Senate, whose decrees (*senatus consulta*) have been the model of succeeding ages. During the Imperial period the legislative function gradually passed out of the hands of the Senate into those of the Emperor, whose judgments and decrees (known variously as constitutions, decrees, rescripts, and mandates) had the force of law without further sanction. The responses of the jurists (*responsa prudentum*), to whom the actual decision of doubtful cases was referred, likewise derived their authority from their confirmation by the Emperor.

During the mediæval period legislation throughout Europe was a function of the prince, sometimes assisted by a council, but never controlled by it. Toward the close of the Middle Ages, however, the rise of Parliament in England led to the withdrawal of a considerable part of the legislative power hitherto exercised by the King, and its assumption by Parliament. (See LEGISLATURE.) Elsewhere this power was retained by the princes until the nineteenth century, during the course of which period representative legislative bodies were provided in all those countries which established constitutional systems of government. According to the modern idea of the term, legislation has reference to the formal enactments of those representative bodies especially created for purposes of lawmaking. But besides the body of legislation emanating from the legislatures there is another important body of law peculiar to modern States which goes by the name of organic or fundamental legislation, and is embodied in the various constitutions of government. This form of legislation differs from the preceding class both as to source and status. In the first place, it emanates usually from constituent assemblies, or, as they are popularly called in America, constitutional conventions; and, secondly, it takes precedence in authority over the body of law which emanates from the legislatures. There is still a third form of law-making commonly known as direct legislation, which results from the application of the principle of the referendum (q.v.). According to this method legislative projects are initiated by the legislature or by popular petition and submitted directly to the electorate for its approval or disapproval, the validity of the statute being conditioned upon its acceptance by a majority of the voters at the polls. This method of legislation is resorted to quite generally in Switzerland, both in the Federal and cantonal governments, as well as in many of the American States. Recently constitutional amendments have been submitted in several States of the Union for the establishment of a system of popular initiative in legislation, such as exists in Switzerland. There are undoubtedly signs of a growing tendency in the United States to accord a more general recognition to this method of legislation as a means of avoiding certain evils of the representative system.

The last form of legislation to be mentioned in this connection is that enacted by municipal and quasi-municipal corporations (counties, townships, etc.). This class of legislation deals with matters chiefly of local concern, but partly of interest to the State at large, and is enacted as a result of special grant from the legislature. In Europe, as a rule, there is a more general grant of legislative power to the localities. In the municipalities (q.v.) the organ of legislation is a representative council, sometimes consisting of a single chamber, sometimes of two, the right of veto usually being given to the mayor. In the counties it is usually a small representative board of commissioners or supervisors; in the townships it is sometimes a popular assembly of the voters, sometimes a smaller body of trustees or commissioners.

Statutory legislation in the United States is from the standpoint of its territorial application classified as *general,* when it applies to the State as a whole, and *special,* when its application is restricted to a particular locality. The abuses which have arisen from the practice of special legislation have recently led to the incorporation of provisions in many State Constitutions to prohibit this form of legislation, but they have frequently been evaded by a system of municipal classification. See MUNICIPALITY.

Viewed from the standpoint of time of operation, legislation may be either *prospective* or *retroactive.* Retroactive legislation unless for curative purposes is generally objectionable and is generally regarded with disfavor. Such legislation when applied to criminal matters, or when it is intended to impair the obligations of contracts, is forbidden by the Constitution of the United States. Looked at from its content legislation may be either *substantive* or *remedial.* Legislation of the former character creates and defines individual rights; of the latter, provides remedies and affords protection.

The methods and processes of legislation roughly fall into two general classes: (1) the cabinet method, and (2) the congressional or committee method. According to the first method, which prevails everywhere in Europe, except in Switzerland and Germany, and even to a limited extent in Germany, the great mass of legislation is formulated and initiated by responsible ministers who have seats in the Legislature and may at the same time be members of that body. Whether members or not, the ministers take part in the debates advocating the adoption of the public measures which they wish to have enacted into law, defending them from the attacks of the opposition and finally resigning when defeated upon any important measure. (See CABINET.) According to the second method there is no ministry to formulate and expedite the passage of bills, but each individual member introduces such public or private bills as he chooses and relies upon the aid of his colleagues to secure their passage. This is the method in vogue in the Congress of the United States, and in the legislatures of the several States. (See UNITED STATES, section on *Government.*) Here the chief agencies for expediting legislation are the committees, which play only a subordinate part in the European systems. Apart from this divergence in the method of initiating and expediting the enactment of public measures, there is a substantial consensus among the leading nations of the world as to the general principles of legislative organization and procedure. (See LEGISLATURE.) The constitutions of many States prescribe detailed rules in regard to the form in which projects of legislation shall be cast, their reference to committees, the number of readings through which they shall pass, the keeping of a journal, the recording of the ayes and nays in certain cases, reconsideration of the executive veto, and sometimes such matters as amendments, divisions, discipline, and petitions.

Consult: Amos, *The Science of Politics* (New York, 1883); Holland, *The Elements of Jurisprudence* (Oxford, 1882); Maine, *Early Law and Custom* (London, 1883); Burgess, *Political Science and Constitutional Law* (Boston, 1896); and Lowell, *Governments and Parties in Continental Europe* (2 vols., Boston, 1896).

LEGISLATURE. That body of citizens in any State or nation, or part thereof, which is specifically empowered to make, alter, and repeal the laws. In some countries, however, the power of the legislature is more or less restricted by what is known as the organic law of those countries. In ancient systems of government, legislatures were not well developed, though in Athens there was an assembly known as the *Ecclesia,* and in Rome there were various councils, which exercised many of the functions which belong to a modern legislature. In the later Roman Empire the chief source of legislation was the Emperor. In the Germanic tribes there were councils, which all freemen could attend, and these survived for a long time in some cases, as for example the Witenagemot (q.v.) among the Anglo-Saxons, though its powers were curtailed. Likewise the origin of the Spanish Cortes has been traced to the early Middle Ages, but in general, legislative power ultimately rested during the Middle Ages in the King or the feudal noble. In the Holy Roman Empire, the Imperial Diet possessed a shadow of legislative authority. Of the mediæval legislatures, the English Parliament is of the most importance, because it was the only one to attain a complete development. It developed out of the Saxon Witenagemot and its successor the Norman Royal Council. Until the thirteenth century, however, it represented only the higher nobility and clergy and possessed little or no independent authority. During the reign of Henry III. members from the counties and towns representing the gentry and the burghers were admitted, and in the struggles which followed over the arbitrary exactions of the King, Parliament, as the new body now came to be called, gained increasing power and finally took over from the King the greater part of the legislative authority hitherto exercised by him. It first asserted the right to raise taxes, then to specify the purposes for which they were to be expended, then to inquire into the abuses of the administration and impeach the King's responsible ministers for misconduct. Next it asserted the right to share with the King the law-making power, and to give its resolutions precedence in authority over royal ordinances, and finally it succeeded in establishing its right to freedom from interference from the royal authority and the right to determine upon the qualifications and elections of its own members.

In the English dominions in America legislatures modeled upon the Parliament of the mother country came to be established in every colony. At the time of the adoption of the National Constitution these bodies were bicameral in form in all the States except Georgia and Pennsylvania, the Lower House everywhere being an exclusively popular body. From the first there was a clear-cut distinction between legislative, executive, and judicial powers, and the early constitutions almost without exception expressly required that each set of functions should be exercised by a separate and independent organ of government. The only legislative power left to the Governor was the right to veto bills and recommend the enactment of laws which seemed to him wise and needful.

At the end of the eighteenth century the political reformers on the European Continent looked to the institutions of England for their inspiration, so that during the course of the nineteenth century most of the countries of Continental Europe adopted written constitutions of government providing for legislative bodies, partially representative at least, and vested with the greater part of the legislative power and often modeled closely upon the English Parliament. In some of the Continental States, particularly France, Germany, and Italy, the chief executive still has a large ordinance power which is not only used to fill in the details of legislative acts, but even to supplement them in some cases. Such ordinances, however. are always subject to alteration or repeal by the statutes. So far as the general principles of legislative organization and procedure are concerned, it may be said that the European and American States have pretty nearly reached a consensus of opinion. In all the countries of America and Europe where legislative bodies exist, except in some of the Balkan and Central American States, the bicameral system has been adopted as having substantial advantages over the old three-chambered bodies of estates, on the one hand, and the single-chambered legislatures on the other. There is also substantial agreement that the lower houses shall be popular bodies and consequently vested with the initiation of financial and revenue measures. With this exception the two houses everywhere enjoy substantial equality of powers in legislation. It is a general principle, however, that the upper houses shall also be vested with certain administrative or judicial functions such as the trial of impeachments preferred by the lower houses, the ratification of treaties, the confirmation of appointments to office, the issue of administrative regulations, etc. Similar distinctions in favor of the upper houses exist in the case of the local legislatures of the United States.

The principle of representation upon which the popular chambers rest is essentially the same almost everywhere, namely. apportionment according to the population, often with some regard to geographical division, and choice by district ticket, rather than the apportionment according to classes of voters and choice by general ticket. A striking exception with respect to the principle of apportionment strictly according to population is afforded by the State of Connecticut. The ratio of representation varies greatly. In the Congress of the United States it is one representative to every 194,000 inhabitants, in the German Empire one to every 131,000, in Great Britain and Ireland (on an average) one to every 63,000, in France one to every 100,000, in Mexico one to every 40,000, and in Switzerland one to every 20,000. There is a great diversity with respect to the principles of representation in the upper houses of the legislatures. In general, the representation is of classes or of territorial divisions. In the United States, France, Switzerland, Mexico, and Brazil, the Upper House represents the individual States or the larger administrative units. In all of these except France the principle is equality of representation without respect to size or population of the area represented. In Great Britain, Spain, Portugal, Italy, Austria, and Hungary the principle of class representation predominates, or, to speak more accurately, no general principle of representation exists. Germany has as a part of its legislature a body, known as the Bundesrat, which though in one sense an upper house, at the same time resembles a meeting of diplomatic representatives of the several States of the Empire.

The source from which the legislatures proceed is now substantially the same everywhere in the case of the lower houses, namely, universal manhood suffrage. To this rule there are exceptions, as in Italy, where a complex system of qualifications (education, tax, rent) prevails; in Great Britain, where there is a household lodger franchise; and in the Netherlands, where the payment of a direct tax is required. So far as the upper houses are concerned, there is considerable variety in the source from which they proceed. In the United States and France the Upper House is chosen by indirect election; in Mexico, the Commonwealth of Australia, and Brazil it is chosen by direct election; in Germany and Switzerland it is appointed by the local governments. The British House of Lords consists of peers of the blood royal, English bishops, English peers (hereditary and created by the sovereign), Scotch representative peers (elected for duration of Parliament), and Irish representative peers (elected for life). The constitution of the Austrian Herrenhaus and of the Hungarian Table of Magnates is in the main very similar to that of the British House of Lords. The composition of the Prussian Herrenhaus is somewhat more complex than that of the Austrian; included in its members are representatives of the large cities and of the universities. The Senate in Italy is composed of princes of the royal house and of an unlimited number of peers, nominated by the King for life. The members of the Senate of the Dominion of Canada are appointed for life by the Governor-General. Among the Commonwealths of the American Union the source of both houses is popular election.

The qualifications for members of the lower houses do not now differ greatly in the various modern States of the world. In general they are male sex; mature age, sometimes twenty-one years, although it is twenty-five in the United States, France, Germany, Spain, and Prussia, and thirty in Italy; citizenship, and residence in the State and sometimes in the district from which the member is chosen. The usual disqualifications are conviction of crime, bankruptcy, pauperism, and the holding of incompatible office at the same time. For eligibility to the upper houses there is usually a higher age qualification, the average being about thirty, although it is thirty-five in Brazil, and forty in France and Italy. In Europe appointed members of the Upper House are usually required to be selected from certain professional, learned, or noble classes. Among the States of the American Union the qualifications for membership in both Houses are the same, usually mature age and citizenship.

There is substantial agreement throughout the United States and Europe as to the rights and privileges of legislative members. These are the right of each House to judge of the elections and qualifications of its own members, freedom from arrest during the session, except for treason or other high crimes, or unless the member is caught in the act of committing a crime; and freedom of debate without responsibility to any power except the chamber for words spoken or votes cast. There is not yet unanimity of opinion on the question of whether members of the Legislature should receive compensation. In the United States, Mexico, Brazil, and France the practice exists of granting compensation to members of both Houses, and in Switerland, Belgium, and Prussia to members of the Lower House. In Great Britain, Germany, Italy, and Spain members receive no compensation. In the American Commonwealths the practice is to grant a small salary or per diem allowance together with mileage (q.v.).

The tenure of legislative members varies greatly. In the upper chambers of the European legislatures it is generally for life or long periods of time, although in France it is nine years, and in Switzerland and Germany it depends upon the will of the local governments. As to the lower houses the tenures are usually for short periods of time, ranging from three years in Switzerland to seven in Great Britain. In the United States it is six years for the Upper House and two for the Lower; in Mexico it is four for the Upper House and two for the Lower; in Brazil it is nine for the Upper and three for the Lower. Frequent provision is made for a partial renewal of the upper houses. Among the individual States of the American Union the most common provision is a four-year tenure for the Senates and two years for the lower houses. In some States, however, annual elections of members of the Legislature are still held, although there is a decided tendency toward the adoption of the biennial method. Relative to the powers of the Legislature over its own assembling, opening, adjournment, prorogation, and dissolution, it may be stated as a general rule that in the American republics and in the commonwealths of the United States this right belongs to the legislatures themselves, subject to certain provisions in the constitutions relative to the times of meeting and the length of the session. In the European legislatures, on the other hand, the more common rule is that these are prerogatives of the head of the State. To this rule, however, there are several exceptions and modifications. So far as internal organization, discipline, and procedure are concerned, the general rule is that each house shall be left to its own judgment subject to a few limitations prescribed by the constitutions relative to publicity of procedure, the infliction of punishment on refractory members, and the organization of the chamber. There is a substantial agreement that a quorum for the transaction of business should be a majority of the legal number of members. In some States this is regulated by statute, and in others it is made a constitutional principle. This rule, however, is departed from in the case of the British Parliament and the German Bundesrat, in both of which cases the presence of a comparatively small number of members is sufficient to transact business.

So far as the frequency of legislative sessions is concerned, it may be stated as a general rule that national legislatures assemble annually. This is required by the Constitutions of the United States and France, while the demands of a complex and increasing civilization make it practically necessary everywhere.

Consult: Bryce, *American Commonwealth* (New York, 1888); Burgess, *Political Science and Comparative Constitutional Law* (Boston, 1896); Marquardsen, *Handbuch des öffentlichen Rechts der Gegenwart* (Freiburg, 1883-94); Demombynes, *Constitutions européennes* (2 vols., Paris, 1884); and Poore, *Charters and Constitutions of the United States* (2 vols., Washington, 1878).

See LEGISLATION; SPEAKER; MINISTRY; GOVERNMENT; and articles on the various countries.

LEGITIM (Fr. *légitime*, from Lat. *legitimus*, lawful), or BAIRN'S PART. In Scotch law, the legal provision which a child is entitled to out of the movable or personal estate of the deceased father. In Scotland a father is not allowed wholly to disinherit his children. If a wife and children survive, the movable estate is divided into three equal parts, one of which is preserved to the children. If only children survive, and not the wife, then half the personal estate is legitim, the other half being called 'dead's part,' and being devisable by the father at his pleasure. Though a father may, in his lifetime, without any check from his children, squander his property, still he is not allowed on his deathbed to make gifts so as to lessen the fund which will supply legitim. The legitim is claimable by all the children who survive the father, but not by the issue of those children who have predeceased. It is immaterial what the age of the child may be, and whether married or not. Children claiming legitim must, however, give credit for any provision or advance made by the father out of his movable estate in his lifetime. All the children, though of different marriages, share equally in the legitim. The principle of the legitim does not exist at the common law, but it obtains in Louisiana and in all the modern States whose legal systems are derived from that of the civil law. See INOFFICIOUS TESTAMENT.

LEGITIMACY. In law, the status of a child who is born in wedlock, or who is rendered legitimate in law by the subsequent marriage of his parents. Any child born during wedlock is presumed to be legitimate, but this presumption may be rebutted by positive proof that the husband and wife had not cohabited for a time which would completely negative any possibility of the former being the father of the child. The old common-law rule was that the child was conclusively presumed to be legitimate unless the husband was 'beyond the seas' for over nine months previous to its birth, but that rule has been modified as above stated. In most jurisdictions a child born out of wedlock may be legitimatized by the subsequent marriage of its parents, in which case it has the same status, in law, as a child born in wedlock. See BASTARD.

LEGITIMATION (from ML. *legitimare*, to make legitimate, from Lat. *legitimus*, lawful). The process of rendering legitimate a person who was born a bastard (q.v.). This is effected by the subsequent marriage of the father and mother of the illegitimate offspring, and hence it is often called legitimation *per subsequens matrimonium*. This effect, however, can only be produced provided at the time of the birth the parents might have been married, or there was no obstacle to their then marrying, if so inclined, as, for example, if they were both unmarried, and there was no impediment. Sometimes it has happened that the father, A, or mother, B, after the child's birth, marries a third person, and has children, and after the dissolution of the marriage A and B marry. In this perplexing case the courts have held that the intervening marriage with a third party does not prevent the bastard child, born before that event, from being legitimated by the subsequent marriage of A and B. But it has not been settled what are the mutual rights of the children of the two marriages in such circumstances, though it appears that the legitimate-born children cannot be displaced by the legitimated bastard. The doctrine of legitimation *per subsequens matrimonium* obtains in Scotland and in the legal systems of the Continent which are derived from the civil law, but is not recognized in England or Ireland, having been solemnly repudiated by the famous statute of Merton, and the maxim prevails there, 'once a bastard, always a bastard.' This harsh rule of the common law still prevails in many of the United States. In several States, however, the milder rule of the civil law has been adopted. Legitimation is also recognized in Scotland, but not in England or Ireland, where the parents were not really married, though they both *bonâ fide* believed themselves to be married. This is called a putative marriage.

LEGITIMISTS (Fr. *légitimiste*, from Lat. *legitimus*, legal, from *lex*, law), THE. In France, after 1830, the party that upheld the claims of the elder line of Bourbons against the younger or Orleanist line. Charles X., who was deposed in 1830, belonged to the Bourbons, while Louis Philippe, who succeeded him, belonged to the House of Orleans. The death of the Count de Chambord, the last of the Bourbon line, in 1883, ended the dispute by leaving the Count de Paris, grandson of Louis Philippe, sole heir to the claims of both branches of the Bourbon family.

LEGNAGO, lâ-nyä'gô. A city in the Province of Verona, Italy, 33 miles by rail southeast of the city of Verona, on the Adige (Map: Italy, F 2). It has a technical school, a city library, and two theatres. The country is fertile though swampy, and Legnago is an important market for rice and other grain, wine, potatoes, and flax. On March 26, 1799, the French, under Scherer, were defeated here by the Austrians under Kray. The old fortifications were razed under Napoleon in 1801. In 1815 the Austrians, to defend the passage of the Adige, refortified Legnago, making it one of the fortresses of the famous Quadrilateral. Population (commune), in 1881, 14,358; in 1901, 14,529.

LEGNANO, lâ-nyä'nô. A town 16 miles northwest of Milan, Italy, on the Olona. Population, about 8000. It is famous for the victory of Milan and the allied Lombard cities over the Emperor Frederick I. Barbarossa (q.v.), in 1176. In the year 1876, the 700th anniversary of the battle, a monument was erected on the battlefield.

LEGOUVÉ, le-gōō'vâ', ERNEST (1807-1903). A French dramatist, essayist, and academician, son of the poet Jean Baptiste Legouvé. His mother died in 1810, and his father soon had to be put in a lunatic asylum, but the orphan had plenty of money and was well educated. In 1829 he won an academic prize for a poem on the discovery of printing, but he first made his mark twenty years later (1849) by the drama *Adrienne Lecouvreur*, written in collaboration with Scribe (q.v.), as were also *Les contes de la reine de Navarre* (1850), *Bataille des dames* (1851), *Les doigts de fée* (1858). His dramas written independently of Scribe are insignificant, save for *Médée*, rather than play which Rachel paid 5000 francs, though Ristori achieved success with it in an Italian translation. Legouvé's dramatic works were collected (1887-90). He wrote also on education, on the social position of women, and on *L'art de la lecture* (1877 and 1881), in which he was an adept. In 1881 Legouvé was made director of studies in the normal school for girls at Sèvres, and in 1887 a commander in the Legion of Honor. Toward the end of his life Legouvé was known for his studies on the character and needs of women and children in France. *La femme en France au XIXème siècle* (1864) was reissued, much enlarged, in 1878. *Messieurs les enfants* appeared in 1868; then came his *Conférences parisiennes* (1872); *Nos filles et nos fils* (1877); and *Une éducation de jeune fille* (1884); all very influential in changing French methods of education. In 1886-87 Legouvé published his autobiography, *Soixante ans de souvenirs*. He was always fond of physical training, which he urged as important to France, and was himself a skillful fencer and pistol-shot. He died March 14, 1903.

LEGOUVÉ, JEAN BAPTISTE (1764-1812). A French poet and dramatist, born in Paris. His first play, *La mort d'Abel*, was produced in 1792, and was followed by *Epicharis* (1793), *Quintus Fabius* (1795), *Etéocle* (1799), and *La mort de Henri IV.* (1806), the only piece he wrote which was well received. His dramatic works lack movement and interest, and the same may be said of his very popular poem *Le mérite des femmes* (1801), which went rapidly through forty editions. Legouvé was elected to the Institute in 1798.

LEGRAND DU SAULLE, le-grän' dṳ sôl, HENRI (1830-86). A French alienist. He was born at Dijon, studied medicine there, and was interne at Rouen and at Charenton; was associate editor of the *Gazette des Hôpitaux* (1854-62); and in 1862 became doctor of medicine with a thesis *De la monomanie incendiaire*. He was an associate of Lasègne at the prefecture of police, Paris; was physician at the Salpêtrière (1877), and chief physician of the special infirmary for the insane at the prefecture of police, Paris (1883). He was long editor of the *Annales médico-psychologiques*. His principal works were: *La folie devant les tribunaux* (1869); an essay on *Le délire des persécutions* (1871); *Etude* *médicoo-légale sur les épileptiques* (1877); and *Traité de médecine légale* (1886).

LEGRENZI, le-grĕn'zē̇, GIOVANNI (c.1625-90). An Italian composer, born at Clusone, near Bergamo. After having studied under Pallavicino, he became organist at Bergamo, and as *maestro di cappella* to the Duke of Ferrara, produced his first opera, *Achille in Sciro*, in 1663. The next year he went to Venice, where he was elected director of the Conservatory de' Mendicanti (1672), and in 1685 became *maestro di cappella* at Saint Mark's. In the later capacity he enlarged the orchestra and introduced a number of innovations. He was one of the first to write trios for two violins and violoncello, and his operas (eighteen in all) are marked by a freer use of melody and a more coherent instrumentation than had been common before his time. In addition to his operas and instrumental compositions, he wrote considerable sacred music. He died in Venice.

LEGRIS DE LATUDE, le-grē' de lȧ'tụd', CLAIRE JOSEPHE HIPPOLYTE. The correct name of the French actress better known as Mlle. Clairon (q.v.).

LEGROS, le-grō', ALPHONSE (1837—). A French painter, born at Dijon. He studied under Lecoq de Boisbaudran, and first exhibited a portrait of his father (1857). Two years afterwards his "Angelus" was highly praised. In 1863 he became professor of etching at South Kensington, and in 1876 was appointed Slade professor of fine arts at University College, London, to succeed E. J. Poynter. His genre pictures are usually of French rural scenes, painted with marked realism; and his portraits, such as those of Burne-Jones, Huxley, and Browning, are notable. He also became known as an etcher and modeler.

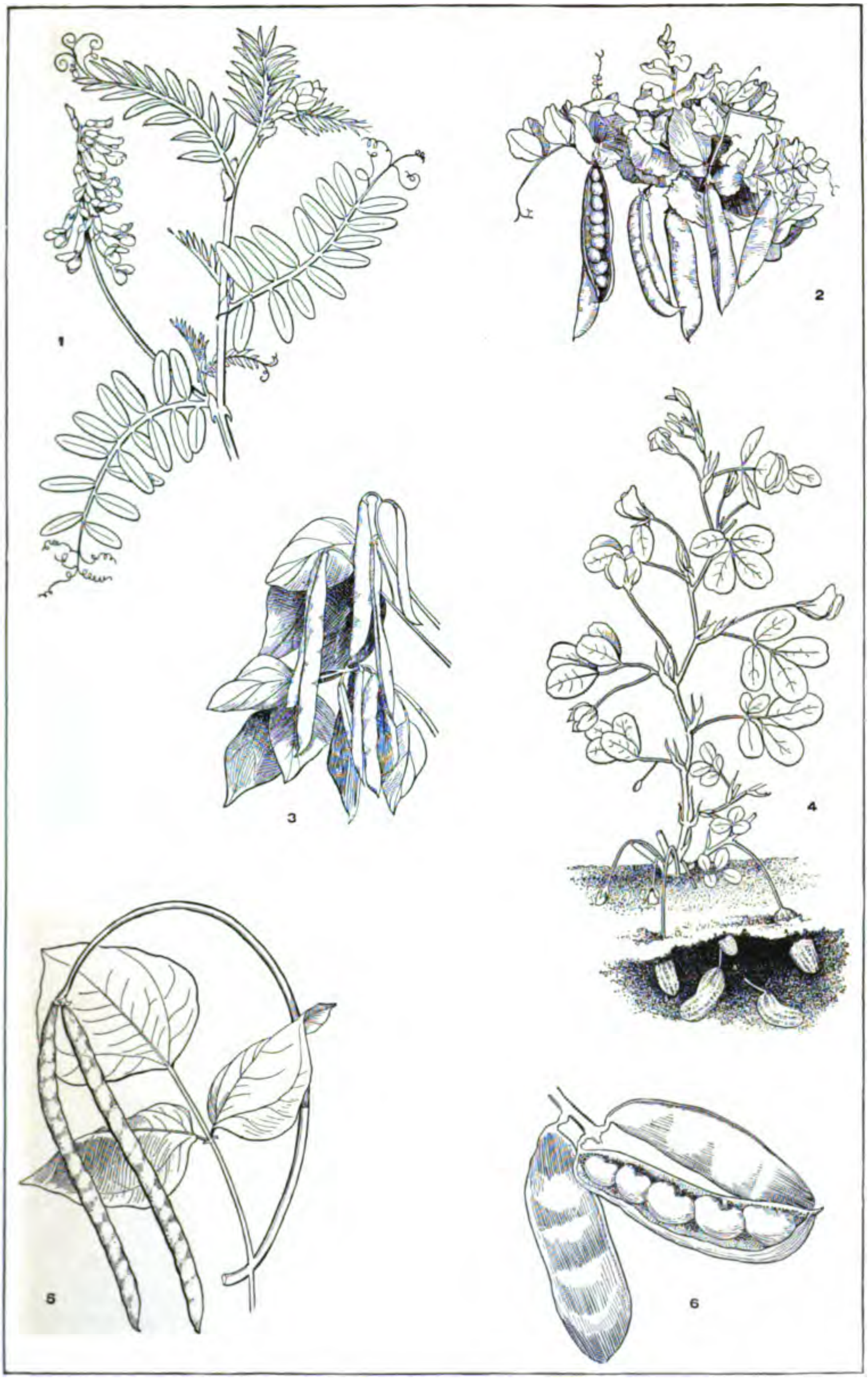
LEGROS, PIERRE (1656-1719). A French sculptor, born in Paris. He was the son and pupil of Pierre Legros (1629-1714), a well-known sculptor, born at Chartres, who was professor at the Academy for many years. Young Pierre studied afterwards in Italy. On his return to Paris he executed several statues at the Tuileries and at Versailles, but as he was not encouraged, he went back to Rome, where most of his works are to be found. There are large religious groups by him in the Turin Cathedral, and in the Church of Saint John Lateran, and Saint Peter's in Rome. They show artistic talent, but very little taste.

LEGUME, lĕg'ūm *or* lē̇-gūm' (Fr. *légume*, from Lat. *legumen*, bean, from *legere*, to gather). A dry, dehiscent fruit which consists of one carpel. This dehisces (opens) by splitting down both sides, as in the pea, bean, etc. It is characteristic of the Leguminosæ or pea family, and is commonly spoken of simply as a 'pod.' See FRUIT.

LEGU'MIN (from Lat. *legumen*, bean). A vegetable proteid of the albumin group, found mainly in the seeds of many plants, including the leguminous plants, such as peas, beans, and lentils. Its exact nature is not known. Ritthausen found legumin from peas, vetches, lentils, and field beans to contain the elements in the following proportions: Carbon, 51.48 per cent.; hydrogen, 7.02 per cent.; nitrogen, 16.77 per cent.; and oxygen, 24.32 per cent. Legumin is insoluble in water, but soluble in very weak acids and alkalies, and it is not coagulated by heat. It resembles the casein of mammalian milk, with which it was considered identical by Liebig and others, and was therefore called 'vegetable casein.' It contains less carbon and more nitrogen, however, than true casein. Upon treatment with sulphuric acid, legumin gives leucin, tyrosin, and glutamic and aspartic acids. It is closely related to congluten, a substance found in the seeds of cereals.

LEGUMINOSÆ (Neo-Lat. nom. pl., from Lat. *legumen*, bean). A great order of dicotyledonous plants, the second of flowering plants in number of species, containing herbs, shrubs, and trees, growing in all kinds of soil and climates, usually erect, but sometimes trailing, twining, or climbing, many of them of great size. The leaves are alternate, usually compound, and have two early deciduous stipules at the base of the leafstalk. The inflorescence is commonly racemose. The calyx is inferior, 5-parted, toothed or cleft, the segments often unequal. The petals are 5, or by abortion fewer, inserted into the base of the calyx, usually unequal, often papilionaceous. The stamens are typically 10, free or united into a tube, in which case 9 are joined by their filaments, the tenth free, otherwise they are few or many, distinct or variously united. The ovary is 1-celled, in some cases 2-celled by a sort of false partition, generally of a single carpel; the style simple, proceeding from the upper margin, the stigma simple. The fruit is usually a pod or legume. The seeds are solitary or numerous, occasionally with an aril, often curved; the cotyledons large and well supplied with reserve material for the young plant. There are three suborders: (1) *Papilionaceæ*, with papilionaceous flowers; (2) *Cæsalpineæ*, with irregular flowers and spreading petals; (3) *Mimoseæ*, with small regular flowers. This order contains about 450 genera and 7000 species, of which about 5000 belong to the suborder Papilionaceæ. They are spread over all parts of the world, from the equator to the limits of vegetation, but their number is greatest in tropical and subtropical regions. They are applied to a great variety of purposes, and some of them are of great importance in domestic economy, the arts, medicine, etc. Many species are interesting on account of their beauty of form, foliage, or flowers. The structure of the flower indicates that the Papilionaceæ at least are designed for insect fertilization, bees being the agents. When a bee lights upon the wings and keel of the flowers, as the side and lower petals are called, the weight thrusts the stigma out of the flower in contact with the pollen-laden body of the bee. When relieved of the weight, the stigma returns to its normal position, and cross-pollination is usually effected. In some cases the returning stigmas may receive pollen from the stamens directly, and thus be close pollenized. In this way the flower has two chances of fertilization. The Leguminosæ are of added interest on account of their ability to assimilate free atmospheric nitrogen through the small tubercles on their roots. These tubercles are the dwelling-places of myriads of peculiar bacteria which enter the roots through root-hairs and set up an irritation resulting in the formation of galls. In these the bacteria multiply

USEFUL LEGUMES



1. VETCH (*Vicia villosa*).
2. GARDEN PEA (*Pisum sativum*).
3. STRING BEAN (*Phaseolus vulgaris*).
4. PEANUT (*Arachis hypogæa*).
5. COWPEA (*Vigna catjang*).
6. LIMA BEAN (*Phaseolus lunatus*).

rapidly and are supplied with their necessary carbohydrates by the plant, and in turn give nitrogen to their hosts. This form of life is known as symbiosis (q.v.), and it is one of the chief reasons why plants of this order are so valuable in enriching the soil. In the seeds of many is found a nitrogenous substance called legumin (q.v.) or 'vegetable casein.'

The discovery that leguminous plants assimilate the free nitrogen of the air through their root-tubercles was made by Hellriegel (q.v.), who also observed the presence of bacteria in the tubercles. Other investigators established the fact of the symbiosis of the bacteria and the root-tubercles and worked out practical methods for the inoculation of the soil with bacterial cultures to promote the growth of legumes even on a large scale. (See the articles Clover; Green Manuring; Root-Tubercles.) The principal genera of the order are: *Mimoseæ*, Acacia, Mimosa; *Cæsalpineæ*, Bauhinia, Cercis, Cæsalpinia, Hæmatoxylon, Cassia, Ceratonia, and Tamarindus; *Papilionaceæ*, Onobrychis, Desmodium, Arachis, Robinia, Lupinus, Astragalus, Cytisus, Ulex, Lotus, Anthyllis, Medicago, Trifolium, Vicia, Lathyrus, Phaseolus, Indigofera, Glycyrrhiza, Amorpha, Crotalaria, Dalbergia, Pterocarpus, etc.

Fossil representatives of this family are common in the Cretaceous rocks of Greenland and in the Tertiary deposits of Europe and America.

LEHIGH, lē′hī. A river of eastern Pennsylvania. It rises a few miles east of Wilkesbarre and flows southeast, breaking in picturesque gorges through the Blue Mountain range, till it reaches Allentown, Lehigh County, where it turns northeast, and enters the Delaware at Easton, after a course of about 120 miles (Map: Pennsylvania, F 2). It is followed for the greater part of its course by the Lehigh Valley Railroad, and passes through a region rich in anthracite coal and iron, for which it is an important outlet. By means of locks and dams it has been opened for slack-water navigation as far as Whitehaven, 84 miles from its mouth.

LEHIGHTON, lē′hī-tŭn. A borough in Carbon County, Pa., 84 miles north by west of Philadelphia; on the Lehigh River, and on the Lehigh Valley and the Central of New Jersey railroads (Map: Pennsylvania, F 3). It is of considerable importance as an industrial centre, stoves, brick, leather, car-springs, furniture, and flour being manufactured. The fair grounds of the County Industrial Society are here. Lehighton owns the electric-light plant, which, however, is leased to private parties for operation. Population, in 1890, 2959; in 1900, 4629.

LEHIGH UNIVERSITY. An unsectarian institution of higher learning at South Bethlehem, Pa., founded in 1865 by Judge Asa Packer (q.v.), of Mauch Chunk, with a gift of $500,000 and 115 acres of land, and incorporated in 1866. By his will Judge Packer, who died in 1879, endowed the university with $1,500,000 and the library with $500,000. The object of Judge Packer was to afford the young men of the Lehigh Valley a complete technical education for the professions represented in the development of the peculiar resources of the region. The university is organized in two departments: the school of general literature, comprising a classical and a Latin-scientific course, leading to the degree of B.A., and the school of technology with highly developed courses in civil, mechanical, metallurgical mining, and electrical and chemical engineering, electrometallurgy, chemistry, geology, and physics, leading to the corresponding engineering degrees and B.S. Graduate courses are offered in both departments, conferring the master's degree in art and science, and summer schools in the engineering courses form part of the required studies. The college buildings, 13 in number, include Packer Hall, the Packer Memorial Church, three well-equipped laboratories for chemistry and metallurgy, physics, and electricity and steam engineering, the Sayre astronomical observatory and a modern gymnasium, valued, together with the apparatus and grounds of seven acres, at $1,250,000. The productive funds in 1903 amounted to $1,250,000, and the annual income to $100,000. The university had an attendance of 581 students, a faculty of 52 instructors, and a library of 117,000 volumes.

LEHMAN, lā′mȧn, Liza (Mrs. Herbert Bedford). An English concert vocalist and composer, born in London. She was the daughter of Rudolph Lehman, a well-known artist; and her mother (who was the daughter of Robert Chambers, co-founder of *Chambers's Journal*) was a composer, writing under the pseudonym of A. L. Liza Lehman studied voice culture under Randegger (London) and Raunkilde (Rome); and composition under Freudenberg (Weisbaden) and Hamish MacCunn (London). Her début as a vocalist was at the London Monday Popular Concerts on November 23, 1885, and she afterwards met with remarkable success throughout Great Britain and Germany. In 1894 she married Mr. Herbert Bedford (a composer of considerable merit) and retired from concert work. Her most successful work, up to 1892, was the *Persian Garden*, the words, taken from the *Rubaiyat* of Omar Khayyam, consisting of a connected group of solos and part songs. Next followed a song cycle from Tennyson's *In Memoriam*, and in 1901 another song cycle called *The Daisy Chain.* None of her later cycles has had the vogue of the *Persian Garden.* Her work is marked by originality of form and expression, and a refinement of sentiment which betrays strongly the influence of Schumann.

LEHMANN, Henri (1814-82). A French historical and portrait painter, born at Kiel, Schleswig, April 14, 1814. He was a pupil of his father, Leo Lehmann, and Ingres. He opened a studio in Paris in 1847. The subjects of his first paintings were scriptural. He took first-class medals in 1840, 1848, 1855; received the cross of the Legion of Honor in 1846, and was made professor of the Ecole des Beaux-Arts (1861). His principal works include: "Tobias and the Angel" (1835); "Jephtha's Daughter" (1836); "Don Diego" (1836); portrait of Charles VII., of Louis VIII.; "Saint Catharine Borne to the Tomb by Angels" (1840); "Hamlet," "Ophelia" (1846); "Leonidas" (1848); "Grief of the Oceanides" (1850); "Adoration of Magi" (1855); "Education of Tobias" (1859); "Rest" (1864); mural paintings in the chapels of the Church of Saint Merry, on the ceiling of the Great Hall in the Palais de Justice, and in the Throne Hall, Luxembourg Palace. He painted a portrait of himself for the Uffizi Gallery, Florence.

LEHMANN, Lilli (1848—). An eminent German dramatic soprano, born in Würzburg.

Her first lessons were from her mother, who was a harp-player and prima donna under Spohr at Cassel. After singing small parts on the stage, she made her début in Berlin as a light soprano in Meyerbeer's *Das Feldlager in Schlesien* in 1870, and became so successful that she was appointed Imperial chamber-singer in 1876, in which year she sang the bird-music in *Siegfried*, and took the part of one of the Rhine-daughters in the Nibelungen trilogy at Bayreuth. She sang in London in 1884, and came to New York, where she was engaged as principal soprano at the Metropolitan Opera House. In 1888 she was married to the tenor Paul Kalisch. Her voice was of superb quality and volume, and gained for her the reputation of being one of the greatest Wagnerian singers of her day. She was unsurpassed in the rôles of Brünhilde and Isolde.

LEHMANN, Max (1845—). A German historian, born in Berlin and educated at Königsberg, Bonn, and Berlin. In 1879 he began to teach in the Berlin Military Academy; in 1887 was made a member of the Prussian Academy, and a year later went to Marburg as professor of history. In 1892 he was appointed to a like chair at Leipzig, and in 1903 became professor of mediæval and modern history at Göttingen. He wrote: *Das Aufgebot zur Heerfahrt Ottos II. nach Italien* (1869); *Der Krieg von 1870 bis zur Einschliessung von Metz* (1873); *Knesebeck und Schön: Beiträge zur Geschichte der Freiheitskriege* (1875); *Stein, Scharnhorst und Schön* (1877); the excellent biography *Scharnhorst* (1886-87); and *Friedrich der Grosse* (1894).

LEHMANN, Rudolph Chambers (1856—). An English lawyer, journalist, and author, born near Sheffield. He graduated at Trinity College, Cambridge, became a barrister of the Inner Temple in 1880, and took a prominent part in Liberal politics. From 1890 he was a member of the staff of *Punch*, and in 1901 was editor of the London *Daily News*. He became known also as an authority on rowing, published a volume on that subject (in the *Isthmian Library*, vol. iv., 1897), and was elected secretary of the Amateur Rowing Association. Further publications by him include a *Digest of Overruled Cases* (with Dale, 1887); *The Billsbury Election* (1892); *Mr. Punch's Prize Novels* (1893), literary satires originally printed in the periodical; *Anni Fugaces* (1901); and *Adventures of Picklock Holes* (1901).

LEHOUX, le-ōō', Pierre Adrien Pascal (1844—). A French historical painter, born in Paris. He was a pupil of Cabanel. His works include: "Hémon près du corps d'Antigone" (1870); "Saint Laurent martyr" (1874), in the Luxembourg, and "Ulysse et Télémaque" (1891). His work is characterized by correct technique and good color. He received a first-class medal, and the Prix du Salon in 1874.

LEHR, lâr, Julius (1845-94). A German economist, born at Schotten, Hesse, and educated at Giessen. He taught at Munich from 1885 until his death. Lehr wrote: *Schutzzoll und Freihandel* (1877); *Eisenbahntarifwesen und Eisenbahnmonopol* (1879); *Politische Oekonomie in gedrängter Fassung* (2d ed. 1892); *Grundbegriffe und Grundlagen der Volkswirtschaft* (1894); and *Produktion und Konsumtion in der Volkswirtschaft* (1895, edited by Frankenstein).

LEHR, lâr, Paul Ernest (1835—). A French jurist, born at Saint Dié (Vosges). He studied in Strassburg, where he became secretary-general of the Consistory for the Evangelical Church of the Augsburg Confession. In 1870 he was appointed professor of comparative jurisprudence at the University of Lausanne, Switzerland. He contributed especially to the knowledge of foreign law by the publication of *Eléments de droit civil germanique* (1875); *Eléments de droit civil russe* i. (1877), ii. (1890); *Eléments de droit civil espagnol*, i. (1880), ii. (1890); and *Eléments de droit civil anglais* (1885).

LEHRS, lârs, Karl (1802-78). A German classical scholar, born at Königsberg. He studied at the university of his native city, and was made professor there in 1835. His most valuable work is *De Aristarchi Studiis Homericis*, a comprehensive treatise on early Homeric criticism (1833; 3d ed. 1882). Of his other writings, mention should be made of his *Quæstiones Epicæ* (1837); *Herodiani Tria Scripta Minora* (1848); *Populäre Aufsätze aus dem Altertum, vorzugsweise zur Ethik und Religion der Griechen* (1856; 2d ed. enlarged, 1875); and *Die Pindarscholien* (1873), an investigation into the sources of the remaining scholia. Consult Kammer, *Karl Lehrs* (Berlin, 1879).

LEIB, līp, Michael (1759-1822). An American politician, born in Philadelphia, Pa., of Pennsylvania-Dutch parentage. A Republican of the most radical type, and at first an ardent supporter of Jefferson, he began his political career as a member of the Pennsylvania Legislature, from which, in 1798, he was transferred to Congress. He was reëlected in 1800 and 1802, and soon attracted attention by his extreme views. In 1802 he became associated with William Duane (q.v.), who, with his journal, the *Aurora*, was beginning to make things uncomfortable for the Jefferson Administration. In 1803 he opposed the bill for the creation of Louisiana Territory, drawn probably by Jefferson and Madison, as conferring 'royal' power upon the Governor. He was the official mouthpiece of the Duane faction in its successful fight against the McKean-Dallas party, the 'quids' as the *Aurora* called them, and, in spite of great opposition, was triumphantly returned to Congress in 1804. On the floor of the House he reëchoed the philippics of the *Aurora* against Gallatin, who had become the special object of Duane's enmity. In 1808 he was elected to the United States Senate, where he continued his hostility to Gallatin and Madison to such an extent as almost to nullify the Administration policy. In 1813, with William Branch Giles (q.v.) and Samuel Smith, he joined the Federalists in refusing to confirm the nomination of Gallatin to the Russian mission with J. A. Bayard and John Quincy Adams. In February, 1814, he resigned his seat in the Senate to become postmaster at Philadelphia, to which post he had been appointed by Gideon Granger (q.v.), the Postmaster-General. The appointment, made in the face of the President's opposition, resulted in Granger's dismissal, and legislation which required the confirmation of postmasters in the future.

LEIBL, lī'b'l, Wilhelm (1844-1900). A German genre painter, born in Cologne. He was a pupil of Piloty and Ramberg at the Munich

Academy, then studied in Paris, where he was influenced by Courbet. His highly prized scenes from peasant life, marked by strong realistic characterization of the rustic types and excellent modeling of the heads, are represented to great advantage in the National Gallery in Berlin, by "Peasant Women of Dachau Conversing," "A Huntsman," and "The Two Poachers;" in the New Pinakothek, Munich, by "Interior of Peasant's Home" and "In a Small Town;" and in the Dresden Gallery by "Peasant Girls Knitting." At the art exhibition of 1895 in Berlin the great gold medal was awarded to him.

LEIBNITZ, lib'nits (Ger., Leibniz), GOTTFRIED WILHELM VON (1646-1716). A German philosopher and mathematician, born in Leipzig. His father, who was professor of law at the university, died when Leibnitz was six years old. He studied at the *Nikolaischule* of his native city, under Thomasius; entered the university with unusual preparation, in his fifteenth year, and selected the law as his profession, but devoted himself also to philosophy and literature. When seventeen years old he defended a remarkable thesis entitled *De principio Individui*, and during the following summer he spent some time at the University of Jena, studying mathematics. In 1664 he published *Specimen Difficultatis in Jure*, and in 1666 *Ars Combinatoria*. In that year he presented himself for the degree in law. In consequence of his youth, however, he was not permitted to take it at Leipzig, but a few months later, November, 1666, he received the degree of *doctor juris* from Altdorf. After pursuing further studies he had the good fortune to become a kind of protégé of Baron von Boyneburg, ex-Prime Minister to the Elector of Mainz. At Boyneburg's suggestion, he dedicated to the Elector an essay, *Nova Methodus Discendæ Docendæque Jurisprudentiæ* (1667). This gained an appointment for Leibnitz in the Elector's service. Leibnitz now (1668-69) set to work to reform the *Corpus Juris* (q.v.). Meanwhile he published several theological treatises. In 1670, at the age of twenty-four, he was appointed assessor on the bench of the upper court of appeals, which was the supreme court of the electorate. In 1672 he accompanied Boyneburg's sons to Paris, and there submitted to Louis XIV. a plan for the invasion of Egypt. Leibnitz's real intention in this memorandum was to divert Louis's attention from plans against Germany. From Paris he went to London; both in Paris and in London he formed the acquaintance of the most eminent philosophers, among them Newton, Huygens, and Malebranche. In 1676 Leibnitz entered the service of the Duke of Brunswick-Lüneburg as librarian and privy councilor. After a tour of historical exploration, he prepared a series of works illustrating the history of the House of Brunswick. He undertook likewise the scientific direction and organization of the mines in the Harz, into which he introduced many improvements; he took an active part in negotiations for Church unions, and in the theological discussions connected therewith, which formed the subject of a protracted correspondence with Bossuet and with Pélisson. His private studies, however, were chiefly philosophical and philological. He was chief organizer and first president of the Society of Sciences of Berlin, which later became the Berlin Academy; and he originated at both Dresden and Vienna projects for the establishment of similar bodies. It was to him, likewise, that Peter the Great owed the plan of the since celebrated Academy of Saint Petersburg. The Czar bestowed on Leibnitz a pension and the title of privy councilor. In 1714 Leibnitz wrote the *Monadologie* in French for Prince Eugene of Savoy. Toward the close of his life Leibnitz spent some time in further work on the annals of the House of Brunswick, and was drawn into a philosophical controversy with Samuel Clarke (q.v.). Before the close of the controversy he died rather unexpectedly at Hanover, November 14, 1716. A monument has been erected to him in Hanover, and in 1883 a statue was unveiled in Leipzig.

Leibnitz was eminent in history, divinity, philosophy, political studies, experimental science, mathematics, mining engineering, and even belles-lettres. But it is chiefly through his philosophical reputation that he lives in history. He was greatly influenced by the Cartesian philosophy; but he differed from Descartes both in his method and in some of his principles. In epistemology Leibnitz was an opponent of the doctrine that the mind, at birth, is a *tabula rasa*, a blank tablet to be written on by experience. He maintained, on the contrary, that, although we are not born with ready-made knowledge in the sense of clear, distinct ideas, still there are "small, dark notions of the soul," which are not the mere passive receptions of impressions. There may be perceptions of which we are not aware, or which are not aware of themselves. Indeed, in the last resort, Leibnitz denies reality of everything which is not a percipient or a perception. The perception may be very minute, so as not to be self-conscious, or it may be conscious of itself. In the latter case it is called apperception. Growth in knowledge consists in the process of clarification and distinction of ideas. Sense is not fundamentally different from intellect; it is only confused intellect. Nothing comes to the soul from without. Everything it seems to acquire in the process of learning is originally possessed in obscure form. Virtually, therefore, all ideas are innate in the sense that they are not acquired; but the explicit consciousness of them is acquired. That which has presentations is called by Leibnitz a monad, or a unity, just because it is thus a self-contained system of perceptions, not influenceable from without. It is described as having no windows through which it can look out upon the rest of the universe, but as mirroring the whole universe within itself. But because each monad mirrors the whole universe, each is in so far like the others; the perceptions in each are precisely alike in content; the only difference is that these perceptions may vary indefinitely in clearness and distinctness. Those monads in which all perceptions are obscure are called matter; from matter up to God there is no difference in kind, merely a difference in degree of clearness and distinctness of presentations. Monads are found in all stages of clearness of presentation, and each monad tends toward clarification and distinction of these presentations. Those presentations which are merely clear, but not distinct, i.e. which are not confused with others, but are not adequately known in themselves, are objects of empirical or contingent knowledge; those presentations which are both clear and distinct are objects of rational or necessary knowledge. The validity of rational knowledge is guaranteed by the principle of contradiction; that of empirical knowledge by the principle of sufficient reason, which Leibnitz was the first to introduce into a system of philosophy. In other words, necessary truths are analytical, contingent truths synthetical. The latter must have authentication from without; an adequate reason must be given for their validity. The former are authenticated by the fact that it is impossible to think their opposites. The changes that take place at the same time in various monads have no influence on each other. There is no interaction. But there is a preëstablished harmony of such sort that presentations in one monad correspond to those in another. The relation between any two monads is likened to that between two clocks keeping perfect time. They do not influence each other's movements, but they keep together. This correspondence is due to the fact that God, the monad of monads, created all other monads in such a way that in their subsequent course of development their changes should harmonize. These monads are immortal. In choosing to create this world of monads, God selected the best of all possible worlds. God's wisdom gave Him an infinite range of choice; His goodness determined the selection He made. This is Leibnitz's peculiar optimism, which does not assert that everything is perfectly good, but that the world as a whole is the best of all possible worlds. In this way Leibnitz sought to justify God in creating a world with evil in it. This is Leibnitz's theodicy.

His mathematical work is worth special treatment. He began his work on the calculus (q.v.) about the time of his settling in Hanover in 1676, and two years later he had developed it into a fairly complete discipline. It was not, however, until six years after this that he published (1684) anything upon the subject. Two years earlier (1682) he and Mencke founded the *Acta Eruditorum*, and it was in this celebrated journal that most of his mathematical memoirs appeared (1682-92). The first one on the new calculus was his *Nova Methodus pro Minimis et Maximis* (1684). Newton (q.v.) had known and used the principles of the fluxional calculus as early as 1665, and had made them public, although not in print, in 1669. Leibnitz had access to certain letters of Newton's in 1676. He also had the opportunity of knowing of the theory when he was in London in 1673, and with the mathematical acquaintances he met there it might be expected that the new theory would be discussed. There is, however, no exact evidence that he knew anything of Newton's discovery at the time he began his own work. It should, however, be stated that the germs of the theory of the calculus are to be found in the works of Fermat, Wallis, and Cavalieri, all of which were well known at that time in the mathematical world.

The essential differences in the two systems lie in the notation and the method of attack. Newton used x where Leibnitz used dx, and based his treatment on the notion of velocity of material substances where the latter proceeded from the concept of the infinitesimal. As mathematics developed, the differential notation proved greatly superior to the fluxional, and in the first quarter of the nineteenth century it was adopted in England, as it had been adopted a hundred years earlier on the Continent. With this change of notation the so-called fluxional calculus disappeared and the differential calculus took its place.

The further mathematical work of Leibnitz was not of a high order. His contributions to analytic geometry were noteworthy only for laying the foundation (1692) for the theory of envelopes, and for introducing the terms 'coordinates' and 'axes of coördinates.' He contributed a little to the theory of mechanics, but his work was often inaccurate, and he made no great discoveries.

In addition to Leibnitz's works already referred to, special mention should be made of *Système nouveau de la nature* (1665); *Principes de la nature et de la grâce* (1719); *Nouveaux essais sur l'entendement humain* (1765); and *A Collection of Learned Papers Which Passed Between the Late Mr. Leibnitz and Dr. Clarke in the Years 1715 and 1716* (London, 1717). His Latin and French philosophical works have been many times collected, edited, and published. The publishing of a complete edition of all Leibnitz's works was undertaken by Pertz. This edition, as it now stands, contains 4 vols. of history (Hanover, 1843-47); 7 vols. of mathematics, edited by Gerhardt (Berlin and Halle, 1849-63); but of the philosophical portion only one volume appeared. In the *Journal of Speculative Philosophy* are to be found translations of the *Monadologie*, and many of the lesser writings; and some of the important philosophical works have been translated by G. M. Duncan (New Haven, 1890); the *Nouveaux essais* by A. G. Langley (London, 1894); *The Monadology and Other Philosophical Writings*, Eng. by R. Latta (Oxford, 1898).

The literature on Leibnitz is immense. The following works deserve special mention: Dillmann, *Eine neue Darstellung der Leibnizschen Monadenlehre* (Leipzig, 1891); Feuerbach, *Darstellung, Entwickelung und Kritik der Leibnizschen Philosophie* (Ansbach, 1837); Nourrisson, *La philosophie de Leibniz* (Paris, 1860); R. Zimmermann, *Leibnizs Monadologie* (Vienna, 1847); Merz, *Leibnitz* (London, 1884); Harnack, *Leibnizs Bedeutung in der Geschichte der Mathematik* (Stade, 1887). See, also, Höffding, *History of Modern Philosophy* (London, 1900), and Dewey, *Leibnitz's New Essays Concerning the Human Understanding* (Chicago, 1888). Many biographies of Leibnitz have been written. Among these may be named Guhrauer, *Gottfried Wilhelm Freiherr von Leibniz* (Breslau, 1842-46; Eng. trans. Boston, 1845); Pfleiderer, *G. W. Leibniz als Patriot, Staatsmann und Bildungsträger* (Leipzig, 1870).

LEICESTER, lĕs′tẽr. The capital of Leicestershire, England, on the Soar, 100 miles north-northwest of London (Map: England, E 4). It is a well-built town, with spacious and regular streets, interesting municipal buildings, educational and benevolent institutions, and numerous churches, one of which, Saint Nicholas, is partly built of bricks from the old Roman wall. It is a progressive municipality, and owns or maintains an excellent water-supply, gas and electric-light plants, markets, abattoirs, baths, bathing-places, libraries, technical schools, an art gallery, artisans' dwellings, garden allotments, four parks, eight recreation-grounds, and two public gymnasiums, three sewage farms, an isolation hospital, a lunatic asylum, cemeteries, a fire-brigade, and an effective police force. Manufactures of boots and shoes, and woolen and hosiery goods, lace-making, wool-combing, and dyeing are extensively carried on. Leicester lies near a coal-field, and is the centre of a famous agricultural and wool-raising district. An early British city, the capital of the Coritani, it was known to the Romans as Ratæ. It was one of the five Danish burghs, and from 680 to 874 the seat of a bishopric. The Mount or Castle View, an artificial earthwork on which stood the donjon or keep, and the great banqueting-hall, modernized and used as an assize court, are all that remains of the Norman castle, dismantled by Charles I., in 1645. The ruins of the Abbey of Saint Mary Pré—'of the Meadow'—where Cardinal Wolsey died in 1530, still exist. Numerous municipal charters and privileges, the first granted by King John and the last by Queen Elizabeth, governed the town prior to the Municipal Corporations Act. Population, in 1891, 174,600; in 1901, 211,600. Consult: Johnstone, *History of Leicester* (1892); "Leicester as a Municipality," in *Municipal Journal*, viii. 878 (London, 1899); Bateson, Stevenson and Stocks, *Records of the Borough of Leicester* (Cambridge, 1901).

LEICESTER. A tragedy by William Dunlap (1794), said to have been the first American tragedy put on the stage. It is also called *The Fatal Deception.*

LEICESTER, ROBERT DUDLEY, Earl of (c.1532-88). A favorite of Queen Elizabeth. He was the fifth son of John Dudley, Duke of Northumberland, and received a very good education. At an early age he was taken to Court, where he met the Princess (later Queen) Elizabeth. In 1550 he was married publicly to Amy Robsart, and, as far as we know, lived happily with her. After the death of Edward VI. in 1553, Dudley aided in the attempt to place his sister-in-law, Lady Jane Grey, on the throne, for which he was imprisoned in the Tower. On the accession of Elizabeth in 1558, Dudley rapidly advanced and became the Queen's favorite, and for a long time it was thought they would marry. Nevertheless, Elizabeth allowed Dudley little or no influence in political affairs. The intimacy between Elizabeth and Dudley gave rise to several rumors of a scandalous nature, and when in 1560 Lady Amy was found dead from a fall down a flight of stairs, the belief spread that she had been murdered, though as a matter of fact it was probably an accident. Scott's *Kenilworth* is based on the popular rumors of the time. In 1563 it was suggested that Dudley should marry Mary, Queen of Scots, and he was made Earl of Leicester; but in 1565 the Scottish Queen married Darnley. Meanwhile Leicester's future was darkened by the fact that Elizabeth realized the impracticability of marrying him, for he was very unpopular and opposed by all the old nobility. In 1571 he married the widow of John, second Baron of Sheffield, but afterwards refused to acknowledge her as his wife, and in 1578 married Lettice Knollys, Countess of Essex, at the news of which the Queen was very angry. When in 1585 Elizabeth decided to aid the Netherlands in their struggle for independence from Spanish rule, Leicester received command of the expedition, and in the following year the States-General elected him Governor. His incapacity, however, soon showed forth glaringly, and he lost town after town, so that the Dutch were glad when in 1587 he was recalled. In 1588 Elizabeth appointed him commander of the forces assembled to oppose the Spanish invasion, but he died soon after, on September 4, 1588. Leicester was a shallow and vain man, the interest in whom is due almost entirely to his intimacy with the great English Queen. Consult Froude, *History of England from the Fall of Wolsey to the Defeat of the Spanish Armada* (12 vols., 2d ed., London, 1893).

LEICESTERSHIRE. An inland county of England, south of the counties of Derby and Nottingham. Area, 813 square miles; population, in 1891, 373,584; in 1901, 434,000 (Map: England, E 4). The surface is undulating, with no hills exceeding 850 feet. The Soar and Avon, tributaries respectively of the Trent and Severn, are the chief rivers. Coal is mined in the west, and granite, slate, and freestone are quarried. The soil is a loam of varying degrees of fertility, and while barley, wheat, and oats are cultivated, the chief agricultural branches are grazing, stock-raising, and dairy-farming. Stilton cheese is chiefly made in this county; the local breed of sheep is noted for its fine wool. The principal manufactures are hosiery, agricultural implements, and pottery. Capital, Leicester. The early inhabitants were the Celtic Coritani, who were conquered by the Romans. Later the region was part of the Mercian Kingdom, until subdued by the Danes, and afterwards by the Normans.

LEICESTER SQUARE. A London square, formerly Leicester Fields, laid out in the latter part of the seventeenth century. Many French Huguenots made their residence there after the revocation of the Edict of Nantes in 1685, and it is still a popular foreign quarter. Savile House and Leicester House once stood on it, and in the latter Queen Elizabeth of Bohemia died in 1662. Reynolds, Hogarth, Hunter, and Newton lived in the neighborhood, and their busts adorn the square. During the seventeenth century it frequently served as a dueling-ground.

LEICHHARDT, līᴋ'härt, LUDWIG (1813-48?). A German explorer, born at Trebatsch, Province of Brandenburg, Prussia. After studying at Göttingen and Berlin, he traveled in Italy, France, and England, and in 1841 went to Australia. Here he at once began the geological investigations which he later described in his *Contributions to the Geology of Australia.* In 1844 he set out on his second expedition to Australia, and with about seven companions traveled from Moreton Bay, on the eastern coast, through Queensland, to Port Essington, in the extreme north of the continent. After accomplishing this journey, in which he covered about 2000 miles, in sixteen months, Leichhardt returned to Sydney and published the results of his expediition in his *Journal of an Overland Expedition in Australia from Moreton Bay to Port Essington* (1846). At the close of that year he started on his last trip, in which he proposed to go from Moreton Bay across the central part of the continent from east to west. The last information received from him was sent from Macpherson's Station on the Cogoon River, on April 3, 1848. No less than five relief expeditions were organized in 1851-65, but these failed to discover a trace of the lost explorer, whose disappearance remains unexplained. A district or grand division of Queensland, a county of New South Wales, and a town in Cumberland County, N. S. W., not far from Sydney, were named in his honor. Consult the study by Zuchold (Leipzig, 1856).

LEIDEN, lī'den. A city of the Netherlands. See Leyden.

LEIDENFROST, lī'den-frōst, Johann Gottlob (1715-94). A German scientist and professor of medicine. He was born at Rosperwenda, was educated in Giessen, Leipzig, and Halle, and in 1743 became professor at Duisburg. He is best known from his book *De Aquæ Communis Connullis Qualitatibus* (1756) and for his *Opuscula Physico-Chemica et Medica* (1797). In the former he describes the experiment, sometimes called after him, in which he dropped water on a hot plate, and proved the spheroid shape of the drop and the presence of a layer of vapor between drop and plate.

LEIDY, lī'dī, Joseph (1823-91). A distinguished American naturalist, born in Philadelphia, Pa. He obtained his degree in medicine at the University of Pennsylvania in 1844, executed the dissections and drawings for the work on *Terrestrial and Air-Breathing Mollusks of the United States* (Boston, 1845), by Amos Binney, was appointed chairman of the Board of Curators of the Academy of Natural Sciences in 1846, and became demonstrator of anatomy in the University of Pennsylvania. In 1853 he was appointed full professor of anatomy in the Medical School of the university, and in 1882 professor of biology in the Faculty of Philosophy. He was also the first director of the biological department of the university, organized in 1885; and for a time occupied the chair of natural history in Swarthmore College. In 1881 he was elected president of the Academy of Natural Sciences at Philadelphia, and in 1885 president of the Wagner Free Institute of Science in that city. He received the Walker grand honorary prize of the Boston Society of Natural History in 1880, and, for distinguished contributions to the science of paleontology, the Sir Charles Lyell medal of the Royal Geological Society of London in 1884, and the Cuvier medal of the Institut de France in 1888. His contributions to the natural sciences included comparative anatomy, botany, mineralogy, geology, and microscopic zoölogy, helminthology, and more especially paleontology. His researches in connection with the fossil horse and camel, published in the *Proceedings* of the Academy of Natural Sciences and of the Smithsonian Institution from 1847 to 1891, were of acknowledged service to Darwin and Sir Charles Lyell. He also discovered (1846) the hog to be the host by which the parasite *Trichina spiralis* is introduced into the human system. His writings include numerous papers contributed to the *Transactions* of the American Philosophical Society, the publications of the Wagner Free Institute of Science, Smithsonian publications under the auspices of the United States Geological Surveys, and the *Journal* and *Proceedings* of the Academy of Natural Sciences—in all, upward of 1000; *A Flora and Fauna Within Living Animals* (1851); *Description of the Remains of Extinct Mammalia and Chelonia from Nebraska Territory* (1852); *Cretaceous Reptiles of the United States* (1865); *The Extinct Mammalia Fauna of Dakota and Nebraska* (1869); *Contributions to the Extinct Vertebrate Fauna of the Western Territories* (1873); *The Fresh-Water Rhizopods of North America* (1879); *Treatise on Human Anatomy* (1861-89). Dr. Leidy was an honorary member of more than sixty-five scientific societies of the United States and other countries. Consult the article by Frazer in vol. ix. of the *American Geologist* (Minneapolis, 1892), also reprinted as a monograph; the memoirs by H. C. Chapman, in the *Proceedings* of the Academy of Natural Sciences; by Ruschenberger, in those of the American Philosophical Society (1891); by Geikie, in those of the Geological Society of London (1892); and in the publications of the Royal Microscopical Society, London (1891), and the *American Journal of Arts and Sciences* (1891).

LEIF (līf) **ER'ICSON**. See Ericson, Leif.

LEIGH, lē. A town in Lancashire, England, 13 miles west of Manchester. Silk, cambric, muslin, fustian, and agricultural implements are the leading manufactures; there are glass-works, and in the vicinity are productive coal-mines (Map: England, D 3). The town owns its gas, water, and electric-lighting works, baths, markets, and cemetery, and maintains a free library, hospital, and fire brigade. Sewage is chemically treated and utilized. The town dates from the twelfth century, but was not incorporated until 1899. Population, in 1891, 30,900; in 1901, 40,000.

LEIGHTON, lā'ton, Alexander (1568-1649). An English sectary. He was born at Edinburgh, Scotland; was educated at Saint Andrews; and in 1613 became a Presbyterian preacher in London, practicing medicine at the same time. He published: *Speculum Belli Sacri, or The Looking-Glass of the Holy War* (1624), an attack on Romanism; and an *Appeal to the Parliament, or Sion's Plea Against the Prelacie* (1628). The latter was deemed libelous in respect of the King, Queen, and bishops, and Leighton was twice sentenced by the Star Chamber to be whipped publicly, to lose both ears, to stand twice in the pillory, to be branded on the cheek with the letters S. S. (sower of sedition), to pay a fine of £10,000, and suffer perpetual imprisonment in the Fleet. The Long Parliament released him in 1640, after he had been confined for eleven years. He received a pecuniary indemnity, and in 1642 was made keeper of Lambeth Palace as a State prison, where he died.

LEIGHTON, Frederick, Lord (1830-96). An English historical painter. He was born at Scarborough, December 3, 1830, and spent much of his youth in travel. His father, a physician of means, enabled him to prosecute very extensive studies in painting. He began at fourteen in Florence, continuing in Frankfort, Brussels, Paris, and Rome, his chief master having been Steinle at Frankfort. His first picture, exhibited at the Royal Academy, "Cimabue's Madonna Carried in Triumph Through Florence" (1855), made a great impression and was purchased by the Queen. After this he spent four years in Paris, studying part of the time under Ary Scheffer. In 1858 he joined for a short time the Pre-Raphaelite Brotherhood, his "Lemon Tree" and "Byzantine Wellhead" receiving the enthusiastic praises of Ruskin. He soon ceased this manner, and in 1866 his "Venus Disrobing for a Bath," one of his most admirable pictures, secured his election as associate of the Royal Academy. He became a member in 1869, and president in 1878, fulfilling the public functions with especial grace. Although a bachelor, he entertained royally in his fine house at Kensington. He received first-class medals at Antwerp in 1885, and Paris 1889, was an honorary member of many foreign academies and orders, and received honorary degrees from Oxford, Cambridge, and Edinburgh. In 1886 he was made a baronet, and on January 24, 1896, he was raised to the peerage as Baron Leighton of Stretton. He died on the following day in London, and was buried in Saint Paul's Cathedral.

Leighton was a clever rather than a great artist. His work is finished and painstaking, the result of study and cultivated taste, rather than genius. His art is the equivalent of the classical art of Ingres, softened by a sort of romantic feeling. His earlier works (before 1866) include "Paolo and Francesca," the "Odalisque," "Dante at Verona," "Orpheus and Eurydice." Among the most important of his later paintings are: "Hercules Wrestling with Death" (1871); the "Condottiere;" "Summer Moon;" "Damnephoria" (1876); portrait of Sir Richard Burton (1876); "Music Lesson" (1877); "Biondina" (1879); his own portrait (1880), in the Uffizi Gallery, Florence; "Wedded" (1882); "Last Watch of Hero" (1887); "Captive Andromache" (1888); "Bath of Psyche" (1890), Millbank Museum; "Rizpah" (1893); "Phœnicians Trading with Britons," a decoration for the Royal Exchange. He painted a triptych representing "Music," for the Marquand residence, New York, and the Metropolitan Museum possesses his "Lachrymæ." Leighton also attempted a few pieces of sculpture with success, the best of which are "Athlete Struggling with a Python" (1877) and a "Sluggard," both in Millbank Museum. He also designed illustrations to George Eliot's *Romola* and *Dalziel's Bible*. His *Addresses to the Students of the Royal Academy* were published in 1896. Consult his biography, by Mrs. Lang (London, 1885); Rhys (ib., 1895).

LEIGHTON, Robert (1611-84). Archbishop of Glasgow. He was born probably in London in 1611. He entered Edinburgh University in 1627, took his degree of M.A. in 1631, and afterwards proceeded to France. Returning to Scotland, he was appointed, in 1641, to the parish of Newbattle, near Edinburgh; but he was not militant enough to please his fierce copresbyters, while they appeared to him, who had studied far more deeply than any Scotchman of his time the various ecclesiastical politics of Christendom, truculent about trifles. In 1652 he resigned his charge, and in the following year was elected principal of the University of Edinburgh, a dignity which he retained for ten years. After the restoration of Charles II., Leighton, who had long separated himself from the Presbyterian party, was, with much reluctance, induced to accept a bishopric. He chose Dunblane, because it was small and poor. Unfortunately for his peace, the men with whom he was now allied were even more intolerant and unscrupulous than the Presbyterians. Twice he proceeded to London (in 1665 and 1669) to implore the King to adopt a milder course. Nothing was really done, though much was promised, and Leighton had to endure the misery of seeing an ecclesiastical system which he believed to be intrinsically the best perverted and himself made the accomplice. In 1670, on the deprivation of Dr. Alexander Burnet, he was made Archbishop of Glasgow, an office which he accepted only on the condition that he should be assisted in his attempts to carry out a liberal measure for "the comprehension of the Presbyterians." His efforts, however, were vain; the high-handed tyranny of his colleagues was renewed, and Leighton resigned in 1674. After a short residence in Edinburgh, he went to live with his sister at Broadhurst, in Horsted Keynes, Sussex, where he spent the rest of his days in retirement. He died June 25, 1684. Leighton's complete works (he published nothing during his lifetime) are to be found in an edition published in London (ed. by West, 7 vols., 1869-75); a volume of selections by Blair appeared in 1883. The most admired of his writings is his commentary on First Peter. Consult his biography by West and Blair in the editions mentioned above. A Leighton bibliography, compiled by Blair, is in the *British and Foreign Evangelical Review* for July, 1883.

LEINSTER, lĕn′stẽr. One of the four provinces of Ireland, occupying the southeast portion of the country, and bounded on the east by Saint George's Channel and the Irish Sea (Map: Ireland, D 3). Area, 7622 square miles; divided into the counties of Dublin, Meath, Louth, Kildare, Carlow, Kilkenny, Wexford, Wicklow, West Meath, Longford, King's, and Queen's (qq.v). Population, in 1841, 1,982,169; in 1901, 1,150,480.

LEIPA, or **BÖHMISCH-LEIPA,** bē̆′mĭsh lī′pȧ (Bohemian *Česká-Lipa*). A town of Bohemia, Austria, 42 miles north-northeast of Prague (Map: Austria, D 1). Its industries include brewing, sugar-refining, dyeing, and the manufacture of machinery. Population, in 1900, 10,674, mostly Germans.

LEIPO′A (Neo-Lat., probably from the native name). An Australian megapode, called 'native pheasant' and 'mallee-bird' by the country people. See Mound-Bird.

LEIPZIG, līp′tsĭk, or **LEIPSIC,** līp′sĭk. The largest city in Saxony, and the fourth city in size in the German Empire, situated on the Elster, Pleisse, and Parthe, 74 miles by rail northwest of Dresden (Map: Germany, E 3). Leipzig lies in a rich and extensive plain. Its fortifications no longer exist, having given way to pleasant promenades. The mean annual temperature is 46.7° F.; mean rainfall 22 inches.

In the old town, which has become more and more exclusively the business section, are many ancient buildings and narrow streets, diversified by handsome modern edifices in the Renaissance style. Here quaint, shop-lined courts serve to connect streets and shorten distances. This section is surrounded by finely built modern districts, forming both an inner and outer circle of suburbs, beautified by spacious avenues and promenades. Beyond these suburbs are still other suburban areas, which have been legally a part of the city since 1892. The spacious thoroughfare called the Brühl crowns the northern part of the old town. In the vicinity are the monument to Hahnemann, of homœopathic fame, and the monument, with the Polish eagle, on the spot where Poniatowski was drowned at the beginning of Napoleon's retreat in 1813. Along the avenues in the old town are large squares, the most important of which is the imposing Augustusplatz, surrounded by the university, post-office, theatre, and museum—one of the largest squares in Germany. In the Johannisplatz rises the Reformation monument to Luther and Melanchthon, unveiled in 1883 on the four hundredth anniversary of Luther's birth. In the market-place in the centre of the old part of the town stands the great war monument by Siemering, with bronze figures, unveiled in 1888.

Architecturally the churches of Leipzig have little to offer. The Thomaskirche has more than a local fame for the weekly motets sung by a choir of boys. This church dates from 1222, and was rebuilt in 1496. The University or Pauline Church was dedicated by Luther. During the reconstruction of the Church of Saint John, about 1895, the tomb of Bach was discovered. His remains as well as those of the poet Gellert repose in the new church. Leipzig has an Anglo-American church, dedicated in 1885. Among the prominent secular edifices, the several university buildings are of particular interest. Among these are the extensive Augusteum with an aula and fine reliefs; the Fridericianum, built in 1843; the Mauricianum, dating from 1649; and the immense Albertinum. The university library, containing about 500,000 volumes, was completed in 1891. The imposing new Gewandhaus, with a large concert-room, is enriched with sculptures by Schilling. In front stands the statue of Mendelssohn, who was the conductor of the Gewandhaus concerts for several years. The old Gewandhaus, or Hall of the Cloth-Merchants, where he directed, is now used for business purposes. The splendid Imperial Supreme Court building was completed in 1895. It consists of a central edifice, crowned by a copper dome, 224 feet high, and of wings appropriately adorned with columns and sculptures. Other conspicuous edifices are the German Renaissance Booksellers' Exchange, with archives and a library; the elegant new Renaissance Stock Exchange, with an immense hall; and the Crystal Palace, used for entertainment purposes. In the vicinity stands the curious old Rathaus, built in the middle of the sixteenth century. The Königshaus in the market-place is associated with memories of Napoleon, Charles XII., and Peter the Great. In the old Castle of Pleissenburg, formerly a citadel and destroyed in later years, Luther and Eck held their disputations, and Pappenheim died. The Museum building was completed in 1858, and is ornamented with statues. The splendid new theatre was finished in 1868 in the Renaissance style. Among all the literary associations of Leipzig no other is so famous as Auerbach's cellar, with its curious vaulted ceiling and mural paintings—the scene of a part of Goethe's *Faust*. Among the monuments not already mentioned are a bronze statue of Leibnitz, who was born in Leipzig, and the new monument to Bismarck, and the one to Schumann, who lived here for fourteen years.

Leipzig is the centre of the German book trade, and is famous for its book-making industry. Other of its leading industries are wood-carving and paper-making. Still other products are machinery, leather, textile goods, pianos, tobacco and cigars, chemicals, and foodstuffs. Leipzig leads in the book-selling and publishing trade of the world, over 500 publishing firms having their headquarters here. The city is also very prominent in the art and music trade of Europe. Its commercial importance is due in part to its favorable situation between the Elbe and the Rhine basins, and between the Thuringian mountains and the Erzgebirge. It holds famous fairs at New Year's, Easter, and Michaelmas, with furs, glass, cloth, and leather as the principal lines of trade, the fur sales alone amounting annually to some $5,000,000. Leipzig is in fact a world-market for furs. These historic fairs represent a large volume of business, but are not so important or celebrated as in former centuries. Among the countries importing from Leipzig the United States ranks first. The American imports embrace furs and hides, books, leather gloves and leather, chemicals and volatile oils, bristles, woolen goods, carpets, and musical and other instruments.

Leipzig is famous for its educational advantages. Besides its university (see LEIPZIG, UNIVERSITY OF), there are a municipal gymnasium founded in 1221, among whose celebrated 'cantors' was Bach; another municipal gymnasium, dating from 1511; also a royal and a 'real' gymnasium; a royal art academy; an industrial school; a royal builder's school; and a municipal industrial school. The first commercial high school in Germany was founded in 1898 in Leipzig. Besides the university library there is the municipal library with over 110,000 volumes and 1500 MSS. The museum of the book trade is perhaps the most valuable of its kind in existence. The Grassi Museum contains art-industrial and ethnographical collections; also a fine Historical Museum of Music; and the Permanent Exhibition of Machinery and Furniture. The important collections of the Leipzig Museum include some noteworthy sculptures — Thorwaldsen's "Ganymede," Hildebrand's "Adam," Klinger's "Cassandra" and "Salome," and Schilling's "Phidias." Among its valuable pictures are Preller's cartoons representing scenes from the *Odyssey*, several examples of Lenbach and Böcklin, and Delaroche's "Napoleon at Fontainebleau." These collections contain more than 750 oil paintings, 275 sculptures, and 100 cartoons and aquarelles. The Royal Academy of Plastic Arts dates from 1764. Leipzig abounds in admirable organizations for the advancement of knowledge. There are the Historical Society, with relics of the famous battlefield; the Academy of Art; School of Industrial Art; the Technical School; and the celebrated Royal Conservatory of Music, founded in 1887, and attended by over 600 students. In the new Gewandhaus weekly concerts are given in winter.

Leipzig has been since 1879 the seat of the supreme law court of the Empire. It has the seat also of the Imperial Discipline Court, and of numerous important institutions of the Kingdom of Saxony. The city government is administered by an over-burgomaster, a burgomaster, a police director, about 25 magistrates and some 75 councilmen. The annual budget balances at over $5,000,000. The city debt amounts to some $12,500,000. There is spent annually for schools about $1,000,000, and for the sick and the poor about $450,000. There are two municipal as well as other gas companies. The water-works belong to the city. Since 1897 all the street railways have been electric. Among the many excellent hospitals the most prominent perhaps is that of Saint John's, built in 1872. The municipal bakery is one of the features of the city. The environs, attractive for their fine woods and meadows, are famous as having been the scene of the great battle of Leipzig (see LEIPZIG, BATTLES OF). In 1900 the population was 455,089, nearly all Evangelical.

The town of Leipzig arose about the beginning of the eleventh century, close to a Slavic settlement called Lipzi (afterward Lipzk, Lipzik), a name derived from *Lipa*, a linden-tree. It obtained municipal rights in the twelfth century and soon became a flourishing seat of commerce. It came under the dominion of the House of Wettin, and after the partition of the Saxon territories in 1485 belonged to the Albertine line. Leipzig suffered terribly in the Thirty Years' War.

LEIPZIG, BATTLES OF. Leipzig was the scene of three noteworthy battles, two in the Thirty Years' War (q.v.), and one in the Napoleonic wars. (1) The first battle of Leipzig (or Breitenfeld, from the plain on which it was fought, about a mile from the city) was the first great battle in Germany of Gustavus Adolphus (q.v.). The Elector of Saxony, John George I. (q.v.), was vacillating between the Imperial side and that of his fellow-Protestants when Tilly (q.v.), the Imperial general, invaded Saxony and took Leipzig. The Elector closed an alliance with Gustavus, who on the 7th (new style, 17th) of September, 1631, joined battle with Tilly. The Imperial army numbered about 44,000 men, that of Gustavus about 20,000, Swedes and Saxons. Tilly succeeded in routing the Saxon troops, but succumbed to the valor of the Swedes and the genius of their commander. The Imperial army lost from 7000 to 10,000 men, while the loss on the part of the Protestant forces was about 2700, of whom only 700 were Swedish troops. The battle of Leipzig or Breitenfeld is important in military history as decisively demonstrating the superiority of mobility over weight in battle. More important still was its effect upon the progress of the Thirty Years' War. It was the first serious check which triumphant Catholicism had as yet encountered.

(2) The second battle of Leipzig or Breitenfeld was won by the Swedes under Torstenson against the Imperialists, October 23 (new style, November 2), 1642.

(3) The most celebrated of the battles around Leipzig was that fought between the French under Napoleon and an allied army of Austrians, Russians, Prussians, and Swedes under the supreme command of Prince Schwarzenberg, October 16-19, 1813. It marked the triumphant issue of the Prussian War of Liberation, and is known as the Battle of the Nations from the number of nationalities that participated in the contest. German, Spanish, Italian, Portuguese, and Polish contingents fought in the ranks of the French army. At Dresden, on August 26-27, 1813, Napoleon had won his last great victory in Germany, and this had been followed by a series of conflicts, Culm, Gross-Beren, and Katzbach among others, in which separate corps of the French army met with disaster. Napoleon took his last stand at Leipzig as the most favorable situation from which to threaten the individual armies that were converging on his position from Bohemia, Silesia, and the North. The disposition of the French forces on the first day of the battle was as follows: To the southeast of the town and at a distance of some four miles was the main force under Napoleon, numbering about 130,000 men, with 700 cannon, and stretching in a great semicircle between the villages of Markkleeberg and Holzhausen. The extreme right of the line was held by the Poles under Poniatowski, with the corps of Augereau and Oudinot in the centre, and Victor and Lauriston on the left. The Old and Young Guard and the cavalry under Murat and Latour-Maubourg were held in reserve. Napoleon directed the battle in person from the hillock of Wachau. To the west of the town was a force of 10,000 men under Bertrand at Lindenau, guarding the only line of retreat to France, and to the north 30,000 men under Marmont at Möckern, intended to prevent the junction of the Army of Silesia under Blücher and the Army of the North under Bernadotte with the main army of the Allies advancing from Bohemia. Marshal Ney held the general command over the forces of Bertrand and Marmont. Schwarzenberg, who had 200,000 men at his disposal, made the costly mistake of directing an attack on Napoleon's extreme right, and for this purpose a force of 35,000 men was detailed to operate in the swampy ground to the west of the Pleisse in what turned out to be a veritable *cul de sac*, while at the same time the centre of the Allies was greatly weakened. The battle began about 9 o'clock in the morning of October 16th with a tremendous cannonade, which caused fearful havoc in both armies, owing to their compact formation. The fighting was desperate along the entire line. The village of Markkleeberg was taken four times by the Prussians under Kleist and retaken by Poniatowski; at Wachau the Russians under Barclay de Tolly fought with consummate courage, but after six charges were driven back with loss. An attempt to turn the French left likewise failed. Pursuing his advantage, Napoleon directed a fierce cannon fire against the enemy's centre, and followed this up with a charge of 8000 cavalry supported by the infantry corps of Victor and Lauriston. The French horse broke through the first lines of the enemy and advanced almost to the foot of the hill from which the Emperor Alexander and Frederick William III. of Prussia were watching the progress of the battle. Here, however, the Cossacks and the infantry of the guard made a desperate stand, and the French, threatened besides by a renewed attack on their right, delivered by the Austrian troops, who had finally been recalled from their useless expedition to the other side of the Pleisse, retreated to their original position. Had Napoleon received reënforcements in time from Ney, the victory would have been assured; but Ney, after dispatching one of Marmont's corps to the support of Napoleon, recalled it on becoming aware of the approach of Blücher, with the result that valuable time was lost in marching and countermarching, and this division was able to render aid neither to Napoleon nor Marmont. The latter, who had now about 20,000 men at his disposal, was attacked in his position at Möckern by the superior force of Blücher, and after desperate fighting, in which the French lost 4000 men and the Prussians 5500, was compelled to retreat. At Lindenau, Bertrand held his own against the Austrians under Gyulai.

On the 17th, a Sunday, there was no fighting except to the north of the town, where Blücher forced his way nearer to the town walls. Napoleon proposed an armistice to the Austrian Emperor, but received no answer from the Allies, who were encouraged by Blücher's victory and expected to renew the contest on the following day with their forces increased to about 280,000 men by the arrival of a Russian army of 40,000 men under Bennigsen, two Austrian divisions under Colloredo, and the Army of the North under Bernadotte. Though all hope of victory was gone, Napoleon, whose forces after the arrival of Regnier amounted to about 150,000 troops, inexplicably neglected the opportunity to effect his retreat by the way of Lindenau, and contented himself with drawing his lines closer to the town, swinging his army slightly to the north so as to form a curve facing almost due east. To the north on his extreme left was Ney, between whom and Macdonald was the corps of Regnier with the Saxon troops; the centre was held by Victor, Lauriston, and Augereau, with the Old and the Young Guard and Murat's cavalry; on the right were the Poles under Poniatowski. The battle of the 18th involved no remarkable principles of strategy on either side, but developed into a murderous conflict between dense bodies of men crowded together in the streets of the numerous villages surrounding Leipzig, and exposed for hours to the devastating fire of artillery. On the right and centre the French held their own against the divisions of Colloredo, Kleist, and Wittgenstein, the fighting being especially obstinate around the villages of Probstheida, where Napoleon held command. The village of Stötteritz was bravely defended by Macdonald against the troops of Bennigsen. But on the left Ney could not hold out against the forces of Blücher, Bagration, and Bernadotte, and at a critical moment the Saxons in Regnier's corps stationed at Paunsdorf went over to the enemy. Ney was forced to fall back on the town, in spite of reënforcements dispatched by Napoleon. The retreat, however, was stubborn, though in the face of a tremendous cannon fire, the village of Schönfeld being taken and retaken seven times. With nightfall the French retreated into the city, hard pressed by the enemy. There was heavy fighting in the suburbs and at the gates far into the night, and the contest was resumed in the early morning of October 19th. On the part of the French no adequate preparations had been made for effecting a safe retreat, and as division after division of the exhausted troops abandoned the defense of the town to join in the line of march, the streets of Leipzig became choked with fugitives, the only means of escape from the town being by a solitary bridge across the Elster. Owing to a misunderstanding of orders, this bridge was blown up by a French sergeant before the rear guard had crossed, and 15,000 men were left in the hands of the enemy. Large numbers were drowned in attempting to swim the Elster, among these being Prince Poniatowski. At noon the allied monarchs made their entry into Leipzig. The losses of the Allies in the battle are estimated at about 53,000 in dead and wounded, of which the Prussians lost 16,600, the Austrians 14,500, and the Russians 21,900. The French lost 15,000 in dead, 15,000 wounded, 25,000 prisoners, and 23,000 men left behind in the hospitals. The battle of Leipzig effectively shattered the power of Napoleon, and though his genius never shone more brightly than in his masterly retreat across Germany and his defense of the frontier of France, his fall had been rendered inevitable by the issue of this battle. Consult: Jomini, *Life of Napoleon*, vol. iv. (New York, 1864); Gerlach, *Die Schlacht bei Leipzig* (new ed., Leipzig, 1892).

LEIPZIG, COLLOQUY OF. An attempt in the first half of the seventeenth century to reconcile Lutherans and Calvinists. A conference was proposed by the theologians of Hesse and Brandenburg to those of Leipzig. The Elector John George of Saxony having sanctioned the plan of a private conference, the meetings commenced March 3, 1631, at the residence of the upper Court preacher, and, under his presidency, were held daily until March 23d. The Confession of Augsburg was adopted as a basis, and every article examined separately. They agreed on articles v. to vii. and xii. to xxviii., but differed as to iii., the Lutherans maintaining that not only the divine but the human nature of Christ possessed omniscience, omnipotence, etc., by virtue of the union of the two natures in His person, and that the glory which Christ received was only by His human nature; the Reformed theologians, on the contrary, denied that Christ, as man, was omniscient and omnipresent. On the tenth article they could not agree, the Reformed denying the physical participation in the body and blood of Christ in the eucharist, and asserting a spiritual participation by faith. On the article concerning election, the Reformed based election on the will of God, and reprobation on the unbelief of man; while the Lutherans regarded election as the result of God's prescience of the faith of the elect. No decided and permanent benefit resulted from the colloquy.

LEIPZIG, UNIVERSITY OF. After Berlin and Munich, the largest university of Germany, and next to Heidelberg the oldest within the limits of the present German Empire. It was established by the secession of the German students from Prague as one of the results of the Hussite agitation there. (See PRAGUE, UNIVERSITY OF.) The reorganization of that university in 1409 in favor of the Bohemian and at the expense of the German element led to the secession of the Germans, most of whom, with forty teachers, accepted the invitation of Frederick the Quarrelsome of Meissen, and his brother William, and settled at Leipzig, establishing there a university modeled on that of Prague. Two colleges or houses, the *collegium majus* and the *collegium minus*, were provided by the rulers, and the students were divided into four nations—Meissen, Saxony, Bavaria, and Poland. The humanistic movement here was early popular, and later the Reformation affected the university greatly, as it came under the influence of Melanchthon about 1539. The promulgation of the statutes of 1559, which greatly lowered the standards of the institution, closed the period of prosperity, and the university changed little from that time till 1830. As a result, this was a time of almost entire stagnation. Since the thorough reorganization in the latter year, however, Leipzig has taken the high rank it now holds among the German universities. It had in 1901 a budget of nearly 2,500,000 marks and over 3700 students in theology, law, medicine, and philosophy, the greater number being in law and philosophy. Besides a large number of university institutions, clinics, museums, collections, laboratories, and the like, there are a number of private institutes and clinics available for students. The library contains 500,000 volumes and 5000 MSS. A new governing body for the university, the *syndicate*, was established in 1893.

LEISEWITZ, lī'ze-vīts, Johann Anton (1752-1806). A German dramatic poet, born in Hanover. He went to Göttingen in 1770, and became a member of the circle of poets called *Der Hainbund*, which included Stolberg and Voss, and contributed two poems to the Göttingen *Musenalmanach* for 1775, both essentially dramatic and democratic in tone. In 1775, at Brunswick, and later at Berlin and Weimar, he met and soon counted among his friends Eschenburg, Mendelssohn, Lessing, Nicolai, Herder, and Goethe. His single complete play, *Julius von Tarent* (1776), was written in Lessing's style and with much of the latter's dramatic technique. The play was a favorite of Schiller, and was frequently acted in Germany.

LEISLER, līs'lẽr, Jacob (?-1691). A character prominent in the history of colonial New York. He was born in Frankfort, Germany, and in 1660 came to New Amsterdam as a soldier in the Dutch West India Company's service. Leisler's importance in history is due to the part he played in New York affairs in the three years following the English Revolution in 1688. On May 13, 1689, the New York militia, following the example of Massachusetts, which had imprisoned Andros, rose against Lieutenant-Governor Nicholson, and the three royal councilors resident in New York seized the Government for William and Mary, and chose a committee of safety, at the head of which was Leisler, who was appointed commander of the fort. Leisler at once set vigorously to work putting the town in condition to resist an expected attack from the French. One of his acts was to construct a new half-moon battery on the spot which has since taken the name of the Battery. On December 9th a letter from the new Government in England addressed to Nicholson, or, "in his absence, to such as for the time being take care for preserving the peace and administering the laws in the said Province of New York," was delivered to Leisler. Taking this letter as his authority, Leisler assumed the title of Lieutenant-Governor, appointed a council, chose Jacob Milbourne as secretary, and proceeded to carry on the government partly in accordance with the old Dongan charter. A number of the most influential inhabitants, especially those who had held office under the Andros régime, opposed Leisler, and some of them fled to Albany, which for a time held out against his authority, but after the destruction of Schenectady, February 19, 1690, by the French and Indians, submitted to him. Thus for a time he was supreme in the Colony; and some of his most violent enemies were imprisoned. In May, 1690, by his invitation, the first intercolonial congress that had ever assembled met in New York, and planned an expedition against Canada, which, however, was unsuccessful. In January, 1691, Captain Ingoldsby, who sailed from England with Sloughter, the new Governor, but had been separated from him at sea, arrived in the Colony, and, although his commission did not give him authority to act as Governor, demanded possession of the fort and of the government. With this demand Leisler refused to comply, and some blood was shed before Sloughter himself arrived in March. As soon as he was convinced of the new Governor's authority, Leisler surrendered; but, at the instigation of Leisler's enemies, Sloughter convened a special commission of oyer and terminer, which condemned Leisler, his son-in-law Milbourne, and eight others to death. The prisoners were reprieved for a time, but at length Sloughter was prevailed upon to sign the death-warrants of Leisler and Milbourne, and on May 11, 1691, they were hanged. Four years later, however, the son of Leisler prosecuted an appeal in England, and succeeded in getting the confiscated estates restored and the bill of attainder reversed. Upon no other subject in New York colonial history has there been more difference of opinion than upon that of Leisler's character and government, and historians have not yet come to an agreement upon the matter. Consult: Hoffman, *The Administration of Jacob Leisler* (in vol. xiii. of Sparks's "Library of American Biography," Boston, 1844); Brodhead, *History of the State of New York* (New York, 1853-71); and vol. ii. of the *Documentary History of the State of New York* (Albany, 1849-51).

LEIST, līst, Burkard Wilhelm (1819—). A German jurist, born at Western, in Hanover. He was educated at Göttingen, Heidelberg, and Berlin; was made professor of civil law at Basel (1846), and later at Rostock (1847), whence he went to the University of Jena (1853). A pupil of Savigny, he combined the historical method with analysis, and after studies on the fundamental material of law, especially Roman law, made valuable researches in the hypothetical field of Indogermanic law. His more important writings are: *Die Bonorum Possessio, ihre geschichtliche Entwickelung und heutige Geltung* (1844-48); *Civilistische Studien auf dem Gebiet dogmatischer Analyse* (1854-77); *Mancipation und Eigentumstradition* (1865); *Versuche einer Geschichte der römischen Rechtssysteme* (1850); *Der römische Erbrechtsbesitz* (1871); *Altarisches Jus Gentium* (1889); and *Altarisches Jus Civile* (1894-96).

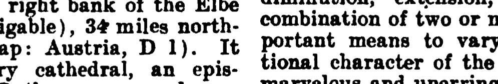
LEITH, lēth. An important town of Scotland, on the Firth of Forth, two miles north of Edinburgh, with which it is connected by a continuous line of houses, and of which it is the seaport (Map: Scotland, E 4). The town is irregular and dingy, especially in the older and central parts, but the Trinity House, custom-house, town hall, royal exchange, corn exchange, and banks are handsome buildings. The city has a Government navigation school. West of the town is Leith fort, an important artillery station, and the fishing village of Newhaven is situated within the port boundaries. Leith combines with Edinburgh in the provision of water and gas; it maintains electric lighting, baths, municipal lodging-house, artisans' dwelling, fire brigade, slaughter-houses, and public parks. The harbor extends by means of two piers upward of a mile into the firth, and has a depth of about 25 feet at high water. There are six dry docks and an equal number of wet docks. The total water area of the docks and harbor is 80 acres. Railway communication is continued from the various Leith stations to the quays, and even to the extremity of the western pier, and across the harbor by an iron swing-bridge. The chief manufactures are ships, machinery, sailcloth, ropes, ale, rectified spirits, soap, bottles, and flour. The trade of the port is chiefly in colonial and foreign produce, but is also extensive in coal and iron exports. Grain, timber, and wine are among the leading imports. A large part of the Continental trade is with Hamburg and Danish, Dutch, and Belgian ports. An average of 4250 ships enter and clear annually a gross tonnage of 3,000,000. Its own shipping comprises about 200 vessels, with a total of about 115,000 tons. Leith is an ancient town, and its history is largely connected with that of Edinburgh. It "buildit ane verry monstruous Great ship, ye Michael," in 1511, for James IV. It was walled and fortified in 1549. Some of the walls and a Saxon archway remain of the citadel built in 1650 by Oliver Cromwell's forces, and destroyed after the Restoration. Population, in 1891, 68,700; in 1901, 76,600. Consult Stevenson, *Annals of Edinburgh and Leith* (Edinburgh, 1839).

LEITHA, lī'tȧ. A river of Austria-Hungary, an affluent of the Danube. It is formed by the junction of two little streams, the Schwarza and Pitten, near Wiener-Neustadt, in Lower Austria, and flows in a northeastern direction, separating (for a short distance) Austria from Hungary (whence their respective names Cisleithania and Transleithania) (Map: Austria, E 2). Passing into Hungary, the Leitha turns southeast and joins the Danube at Altenburg. The total length of the river, from the source of the Schwarza, is over 110 miles.

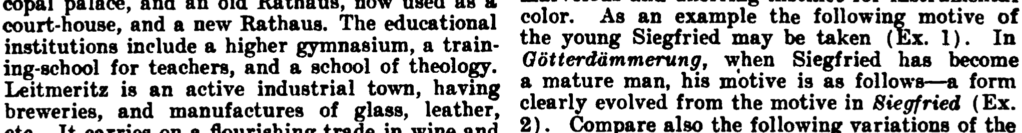
LEITMERITZ, līt'mĕr-ĭts. An old town of Bohemia, Austria, on the right bank of the Elbe (which here becomes navigable), 34 miles north-northwest of Prague (Map: Austria, D 1). It has a seventeenth-century cathedral, an episcopal palace, and an old Rathaus, now used as a court-house, and a new Rathaus. The educational institutions include a higher gymnasium, a training-school for teachers, and a school of theology. Leitmeritz is an active industrial town, having breweries, and manufactures of glass, leather, etc. It carries on a flourishing trade in wine and fruit. Population, in 1890, 11,342; in 1900, 13,075.

LEITMOTIV, līt'mō-tēf' (Ger., leading motive). A term made popular mainly by Wagner, and applied to the musical phrases which constitute the basic material out of which he constructed his musical dramas (q.v.). Previously Weber had used so-called *typical phrases* (q.v.), the object of which was to recall a similar situation. In the works of his second period (*Dutchman, Tannhäuser, Lohengrin*), Wagner makes extensive use of the typical phrase. The phrase characterizing the Dutchman or Lohengrin's warning phrase are heard repeatedly, but they undergo no organic changes, i.e. they are always literal repetitions, even if the instrumentation is varied. It was in Florence that Wagner first conceived the idea of expressing the chief personages and situations of his dramas by means of typical phrases. Any changes of states of the persons were to be represented by corresponding changes of the fundamental typical phrase. The whole music was to be thematically developed from these simple motives, which he thus very happily characterized as *leading motives*. Whereas the typical phrase recalled only similar situations, the leitmotiv characterizes, i.e. represents, essential qualities of persons, things, and even abstract thoughts. Wagner's genius for musical characterization enabled him to invent pregnant motives. Thus he is enabled to give typical musical representations of individual persons (Siegfried, Hunding, Kundry), whole classes of persons (Mastersingers, giants, Nibelungs), forces of nature (storm, fire, forest-sounds), mental states (Brünnhilde's ecstasy, pleading, Mime's plotting, Kundry's longing), general emotions (love, sympathy, compassion). From these latter it is but a step to the representation of symbolism (love-potion, Tarnhelmet, Ring), and general abstractions (Walhall, fate, curse, grail). The leading motives do not occur as mere literal quotations; they undergo vital changes, so as to adapt themselves to the most exacting demands of the dramatic situation. To produce these changes Wagner has recourse to all the technical devices known to musical art: change of harmony, rhythm, melodic intervals, diminution, extension, inversion, contrapuntal combination of two or more themes. Another important means to vary the expression or emotional character of the leitmotiv is the master's marvelous and unerring instinct for instrumental color. As an example the following motive of the young Siegfried may be taken (Ex. 1). In *Götterdämmerung*, when Siegfried has become a mature man, his motive is as follows—a form clearly evolved from the motive in *Siegfried* (Ex. 2). Compare also the following variations of the *Sword-motive* (Ex. 3). The reader is also referred to the *Walhalla-motiv* as it first occurs at the opening of scene two in *Rheingold* and the form in which it appears in the closing bars of *Götterdämmerung*. Through this employment of the leitmotiv Wagner is enabled to attain perfect dramatic unity. Hence there are no closes or cadences within an act. The leitmotivs make their appearance one after another, are logically developed, run through every act until the climax is reached at the end of the drama. The final scene of *Götterdämmerung*, for instance, is absolutely unintelligible, unless the hearer has

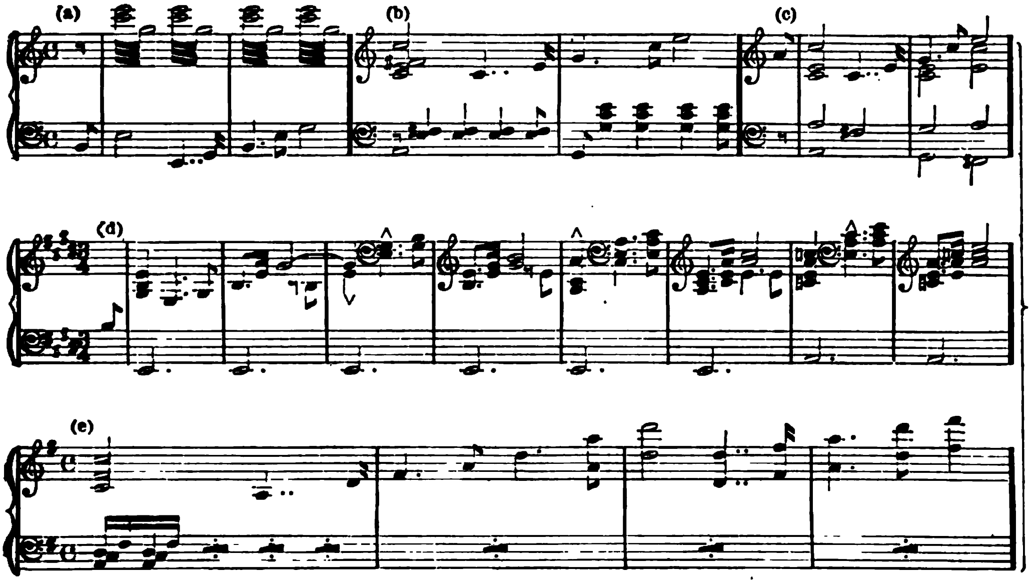
(EX. 1)



(EX. 2)



(ex. 3)



followed the development of the various motives from the beginning of *Rheingold.* Thus it is seen how the principle of the leitmotiv gives organic unity not only to a single drama, but even to a whole cycle of dramas. For a full exposition of this subject, consult: Finck, *Wagner and His Works* (New York, 1898); and Wagner, "Ueber die Anwendung der Musik auf das Drama," in *Gessamelte Schriften und Dichtungen* (10 vols., Leipzig, 1897).

LEITNER, līt′nẽr, GOTTLIEB WILHELM (1830-99). A German Orientalist, born at Pesth, Hungary. His father, a German physician, becoming involved in the Revolution of 1849, went to Turkey, where Gottlieb, who had been well instructed in the classics, learned Turkish, Arabic, and modern Greek. He also acquired English, French, and Italian at the British College in Malta, and was interpreter to the English commissariat during the Crimean War. After the war he went to London, was naturalized as a British subject, and accepted an appointment as professor of Oriental languages and Mohammedan law in King's College. In 1864 he was appointed director of a college at Lahore, in the Punjab. He formed many societies, schools, public libraries, and colleges in India, and organized the Punjab University upon a solid basis. He also found time to engage in the exploration of Tibet and the other countries to the north of the Himalayas, and aroused interest in Dardistan and its languages. He extended his researches to the dialects of Kabul, Kashmir, and Badakhshan, and sent to the Vienna Exposition an extensive collection of Central Asiatic antiquities. His principal work, besides numerous contributions to the proceedings of learned societies in England and upon the Continent, was *The Languages and Races of Dardistan* (1877).

LEITRIM, lē′trĭm. A county in the Province of Connaught, Ireland, which to the north has a small coast-line, on the Bay of Donegal (Map: Ireland, C 2). Area, 619 square miles, half of which is pasture land. Crops of potatoes, oats, and hay are raised, and some coal is mined. Capital, Carrick-on-Shannon. Population, in 1841, 155,300; in 1901, 69,200.

LEIXNER-GRÜNBERG, līks′nẽr-grụn′bẽrG, OTTO VON (1847—). A German author. He was born at Saar, Moravia; studied at Gratz and Munich; and from 1874-76 was editorially connected with the *Gegenwart,* at Berlin, and became well known as a critic of literature and art. His first considerable work was an *Illustriete Litteraturgeschichte* (1879-82). His further publications include: *Gedichte* (1877); *Dämmerungen* (1886); *Soziale Briefe aus Berlin* (1891); and *Sprüche aus dem Leben für das Leben* (1895).

LEJEAN, le-zhäN′, GUILLAUME (1828-71). A French explorer and geographer, born at Plouégat Guérand, Finistère. He devoted himself to the study of Breton history, and in 1850 published *La Bretagne, son histoire et ses historiens.* He then took up the study of geography; traveled extensively in the Balkans (1857-58, 1867-70), and in Egypt and Northern Africa (1860); was consul in Abyssinia (1862-63) until driven out by King Theodore; then traveled in Western Asia. He wrote: *Ethnographie der europäischen Türkei* (in Petermann's *Mitteilungen,* 1861); *Voyage aux deux Nils* (1865-68); *Théodore II., le nouvel empire d'Abyssinie et les intérêts français* (1865); and *Voyage en Abyssinie* (1873). He published valuable maps of European Turkey and of the Nile. Consult Cortambert, *Lejean et ses voyages* (Paris, 1872).

LE JEUNE, le zhēn′, PAUL (1592-1664). A French Jesuit missionary, who, in 1632, went to Canada. In the same year he wrote a *Briève relation du voyage de la Nouvelle France* (1632), the first of the collection known as the *Relations des Jésuites en la Nouvelle France.* He became superior of the Jesuit house in Quebec, and edited every year from 1633 till 1639 a *Relation de ce qui s'est passé en la Nouvelle France* (Paris, 1634-40). On his return to France in 1640 he was made procurateur of foreign missions.

LEKAIN, le-kăn′, Henri Louis (1728-78). A French tragedian. He was born in Paris; established a private theatre, and with Voltaire's help became popular, and finally appeared at the Théâtre Français. His voice and figure were bad, but study greatly improved the former, and his sympathetic power soon won him great success and a place among the most famous French tragic actors. His *Mémoires* were reprinted in Paris, under the direction of Talma, in 1828.

L. E. L. The initials and nom-de-plume of Letitia Elizabeth Landon, later Mrs. Maclean.

LE′LAND, Charles Godfrey (1824-1903). An American poet, journalist, humorist, and miscellaneous writer, born in Philadelphia, August 15, 1824. Some years before his graduation at Princeton, in 1845, his precocious talent had found voice in short poems contributed to the newspapers. After graduation he studied at Heidelberg, Munich, and Paris, and was one of the American deputation to congratulate the French Provisional Government on the Revolution of 1848, in the course of which he joined the students of the Latin Quarter behind the Paris barricades. In that year he returned to Philadelphia, studied law, was admitted to the bar in 1851, continued to write for periodicals, and soon devoted himself entirely to literature and to editorial and journalistic work. He made a special study of Gypsy language and history and attained much reputation both as a German scholar and as a describer of German and German-American life. Leland's widely read *Hans Breitmann's Ballads* tell, in the patois called 'Pennsylvania Dutch,' many humorous conceits and droll adventures of their clownish hero. Leland himself was sometimes spoken of as 'Hans Breitmann.' He wrote, however, under his own name. Leland's editorial work took him for a time to New York, but he returned to Philadelphia in 1855, and in 1861 established in Boston the *Continental Magazine*. He soon returned to Philadelphia, however; traveled in the Middle West, and was from 1869 to 1880 resident chiefly in London, pursuing Gypsy studies. Returning to Philadelphia, he was active in furthering industrial-art education in the public schools, and wrote for this purpose several manuals, after his visit to the United States in 1880; but thenceforward he lived in Europe and he died in Florence, Italy, March 20, 1903. His published volumes comprise, among others: *The Poetry and Mystery of Dreams* (1855); *Meister Karl's Sketch Book*, sketches of foreign travel (1855); *Pictures of Travel*, the first of his translations of Heine (1856); *Sunshine in Thought* (1862); *Heine's Book of Songs* (1862); *Legends of Birds* (1864); *Hans Breitmann's Ballads*, his best known work; *Hans Breitmann About Town and Other New Ballads; Hans Breitmann in Politics; Hans Breitmann and His Philosopede; Hans Breitmann's Party, with Other New Ballads; Hans Breitmann as an Uhlan* (1867-70; complete ed., Philadelphia, 1871; London, 1872; new ed. 1874); *The Music Lesson of Confucius*, philosophic verses (1870); *Gaudeamus*, songs translated from the German (1871); *Egyptian Sketch Book* (1873); *English Gypsies and Their Language* (1873); *English Gypsy Songs* (1875, in collaboration); *Fu-Sang, or the Discovery of America by Chinese Buddhist Priests in the Fifth Century* (1875); *Johnnykin and the Goblins* (1876); *Pidgin-English Singsong* (1876); *Abraham Lincoln* (1879); *The Minor Arts* (1880); *The Gypsies* (1882); *Algonquin Legends of New England* (1884); *Autobiographical Memoirs* (1893); *Songs of the Sea and Lays of the Land* (1895); *Hans Breitmann in Tyrol* (1895); *One Hundred Profitable Acts* (1897); and *The Unpublished Legends of Vergil* (1899). His last work was a volume of Indian folklore verses (1903), called *Kuloskap the Master, and Other Algonkin Poems*. This was done in collaboration with Dr. John Tynely Prince.

LELAND, John (1691-1766). An English divine and Christian apologist. He was born at Wigan, in Lancashire; became a Dissenting minister in Dublin, and first appeared as an author in 1733 by publishing a reply to Tindal's deistical work, *Christianity as Old as the Creation*. In 1739 appeared another apology, *The Divine Authority of the Old and New Testament Asserted Against the Unjust Aspersions and False Reasonings of a Book entitled "The Moral Philosopher"* (by Henry Morgan). He also attacked Henry Dodwell and Bolingbroke. His best work is *A View of the Principal Deistical Writers that Have Appeared in England* (1754-56), which once held a high position in Christian apologetic literature. Consult Weld's memoir in Leland's *Discourses* (1768-69).

LELAND, or **LEYLAND**, John (c.1506-52). An English antiquary. After a thorough study of the ancient and modern languages at Cambridge, Oxford, and Paris, he took holy orders, and in 1533 received from Henry VIII. the unique office of King's Antiquary. In this position he explored the antiquities of the various religious and educational institutions of the Kingdom, and visited every nook and corner of the country for the purpose of examining the topography as well as the archæological relics. Though a laborious historian, he was credulous and unsystematic. His principal works were: *A New Yeare's Gift to King Henry VIII. in the 37th Yeare of His Raygne* (1546); *Commentarii de Scriptoribus Britannicis* (2 vols., 1709); *Itinerary of England* (1710-12); and *De Rebus Britannicis Collectanea* (1715). Some of his autographic manuscripts finally made their way into the Bodleian Library, Oxford; others into the British Museum. Later historians have found them a great store of information. His labors so overtaxed his mind that during the last two years of his life he was insane. Consult Burton, *Life of John Leland (the First English Antiquary), with Notes and a Bibliography of His Works, including those in MS., printed from a hitherto Unpublished Work* (London, 1896).

LELAND STANFORD JUNIOR UNIVERSITY. A co-educational institution of higher learning at Palo Alto, Cal., founded by Leland Stanford (q.v.) and his wife, Jane Lathrop Stanford, in memory of their only child, Leland Stanford, Jr., who died in 1884. The grant of endowment was made in 1885, the cornerstone of the first building was laid in 1887, and the university was opened to students in 1891. The original endowment consisted of about 90,000 acres of land in various parts of California, including the Palo Alto estate of some 9000 acres, constituting the site of the university; the Vina estate of 59,000 acres in Tehama County; and the Gridley estate of 22,000 acres in Butte County. By the will of Mr. Stanford the university received $2,500,000, and after his death

COURT OF INNER QUADRANGLE

A CORNER OF THE INNER QUADRANGLE

Mrs. Stanford deeded to it almost the whole of the residue of the estate, including the Stanford residence in San Francisco, making the total endowment about $30,000,000. The main part of the endowment included in the gifts of Mrs. Stanford consists of interest-bearing securities. During several years a suit by the United States Government involving such securities seriously crippled the institution and threatened its existence, but was finally decided in favor of the university. It was for the most part relieved from the taxation of its property, through an amendment to the State Constitution ratified in 1900. The university lies 33 miles southeast of San Francisco in the Santa Clara Valley, its site covering about 9000 acres, affording views of the Bay of San Francisco, the ocean, and the Monte Diablo and Santa Cruz ranges. The architecture is a modification of the style of the old Spanish missions. The central buildings, of buff sandstone, with roofs of red tile, constitute two quadrangles, one surrounding the other, of which the inner was completed in 1891, and contains twelve one-story buildings and an imposing court 586 feet long by 246 feet wide. The outer quadrangle, consisting in the main of two-story buildings, connected by an arcade, was begun in 1898. Among the twelve buildings of this quadrangle are the Assembly Hall, the temporary Library, the Memorial Arch, and buildings of the departments of Science, Engineering, Economics, History, and English. The museum, chemistry building, dormitories, gymnasium, and University Inn, a university commons leased and managed by the students, occupy detached structures. The grounds about the university are reserved for experimental and ornamental purposes and for residences of the faculty. Considerable damage was done to the university buildings by the earthquake of April, 1906. (See SAN FRANCISCO EARTHQUAKE). The engineers' report showed that the damage was much less than external appearances at first indicated. None of the buildings of the inner quadrangle was injured. The four corner two-story buildings and the one-story physics building of the outer quadrangle and the chemistry building needed partial rebuilding. The new unfinished Library and Gymnasium were wrecked. There was no injury to books, and very little to apparatus or collections. The architectural features suffered most. The magnificent Memorial Church, a structure of Moorish Romanesque architecture, and the Memorial Arch, decorated by a frieze designed by St. Gaudens, were completely wrecked.

The university maintains departments of Greek, Latin, Germanic languages, Romance languages, English, philosophy, psychology, education, history, economics and social science, law, drawing, mathematics, physics, chemistry, botany, physiology, hygiene, zoölogy, geology, and mining, and civil, mechanical, and electrical engineering. The Seaside Laboratory of Natural History at Pacific Grove, on the Bay of Monterey, is a branch of the biological work of the university. The degrees conferred are Bachelor of Arts, Master of Arts, Engineer, Juris Doctor, and Doctor of Philosophy. No honorary degrees are given. Degrees are conferred without regard to the time spent, whenever the requirements are met. Each student selects as his major subject the work of some one department, to which, together with the necessary minor subjects, he is required to devote about a third of his undergraduate course. All the rest of the undergraduate work is elective, but the professor in charge of the major subject acts as the student's educational adviser. In the matter of entrance requirements the attempt has been made from the outset to insist upon an adequate preparatory training without prescribing particular subjects, and to recognize everything of disciplinary value in the schools. The only prescribed requirement for admission is English composition, counting two credits of the 15 necessary for full standing. For the remaining 13 credits the student may offer the requisite number selected from 29 different subjects, to which values are assigned. These subjects include, besides those usually required for entrance examinations, Spanish, the natural sciences, physiography, mechanical and free-hand drawing, wood-working, forge work, foundry work, and machine-shop work. The attendance in 1906 was 1785, of whom about 500 were women. There were 118 graduate students. The faculty numbered 122. The library in 1906 numbered 100,000 volumes, including the Hopkins railway library, a valuable Australasian library, and the Hildebrand collection of works on Germanic philology and literature. The Leland Stanford Junior Museum is the outgrowth of collections begun by the son of the founders. The control of the institution is vested in a board of fifteen trustees appointed for ten years.

LEL′EGES (Lat., from Gk. Λέλεγες). In the *Iliad*, a tribe in southwestern Troas, allies of the Trojans. In historic times the name seems to have been applied to a tribe allied to the Carians. Herodotus does not distinguish between them; others declared they inhabited the coast of Asia Minor north of Ephesus, while the Carians dwelt to the south. The Carian Philip of Theangela declared the Leleges to be slaves of the Carians. Owing probably to similarity in names, or possibly to dim reminiscences of historic events, a common Greek tradition identified the Leleges (and Carians) with the pre-Greek population of the islands and even the mainland. Some modern scholars use this name, like that of the Pelasgians, to denote the inhabitants of Greece and the islands in the Stone Age, and in pre-Mycenæan times.

LELEUX, le-lẽ′, ADOLPHE (1812-91). A French engraver and genre painter. He was born in Paris, and began as an engraver and lithographer, but won distinction as a painter. His pictures represent scenes of life in Brittany, Northern Spain, and Algeria, and in the streets of Paris during the Revolution of 1848. He received the cross of the Legion of Honor in 1855. His "Wedding in Brittany," and "Mot d'Ordre," a scene of the barricades of 1848, are in the Luxembourg.—His brother ARMAND (1818-85) was born in Paris, studied under Ingres and in Italy, but turned his attention to genre painting. He had a finer appreciation of picturesque scenes than Adolphe, but less humor and power of expression. He took a first-class medal in 1859, and entered the Legion of Honor in 1860. The Luxembourg Museum contains his "Capuchin Pharmacy in Rome," and "Protestant Marriage in Switzerland."

LELEWEL, lĕl′ĕv-ĕl, JOACHIM (1786-1861). A Polish historian, born at Warsaw. He studied at Vilna, and became lecturer of history at the university in 1814. Public librarian and professor at Warsaw from 1818 to 1822, he returned that year to Vilna, to his old chair. In 1824 he was dismissed upon suspicion of being engaged in secret revolutionary proceedings, and in 1830 was elected a member of the Polish Diet. He was prominent as a leader in the Polish insurrection of that year, became a member of the National Government, and after the failure of the uprising fled to France. He lived in Paris for two years, and was then banished for participation in several Polish conspiracies. He went to Brussels and lived there in great privation. His writings are extensive and of high value. Among them are his *Numismatique du moyen-âge* (Paris, 1835); *Géographie des Arabes* (Paris, 1851); *Géographie du moyen-âge* (Brussels, 1852-57); *History of Poland* (1829); *Regenerated Poland* (1836). His political writings in twenty volumes, entitled *Polska*, appeared in Posen from 1853 to 1876.

LELOIR, l*e*-lwär′, Jean Baptiste Auguste (1809-92). A French historical painter, born in Paris. He was a pupil of Picot, and after travels in Italy exhibited at the Salon of 1835. His other early works were "Sainte Cécile," "Ruth et Naomi," "Marguerite en prison," "Jeunes paysans au bas de la voie sacrée," and "Homère," now at the Luxembourg. A middle period is occupied by mural paintings in several Parisian churches. Later subjects are: a portrait of Henri de Chennevières, "Daphnis et Chloé," "Jeanne d'Arc dans sa prison," "La Madeleine au tombeau," "Saint Vincent," "Jeanne d'Arc enfant," and "Rinaldo et Armida."—His son, Louis Auguste (1843-84), won the second prize at Rome in 1861 after study in his father's atelier. His early works were religious subjects, but later he turned to genre, and was an excellent painter of aquarelle. Among his paintings are: "Daniel dans la fosse aux lions" (1864); "La fête du grand-père" (1875); "Sérénade" and "Les fiançailles" (1878), all aquarelles exhibited at the Exposition of 1878.—Another son, Maurice (1853—), was Alexandre's pupil. Besides illustrations he painted, and exhibited at the Salon and the exhibits of the Society of Aquarellists: "Les marionettes" (1876); "Le dernier voyage de Molière à Paris" (1878); and "La dernière gerbe" (1882).

LELONG, l*e*-lôɴ′, Jacques (1665-1709). A French cataloguer, born in Paris. He studied at Malta, and then in Paris. Afterwards, he was appointed librarian at the Oratorium of Saint Honoré (1699). His reputation rests upon one book, *La bibliothèque de la France*, published after his death (1719), and enriched and republished in 1778. It is a catalogue of all books and manuscripts relative to the history of France, and is of great importance to the student of French history. He also arranged a catalogue of all the editions of the Bible, *Bibliotheca Sacra* (1709 and 1723).

LE LOUTRE, l*e* lo͞o′tr', Louis Joseph (c.1690-c.1770). A French missionary to the Micmacs and Vicar-General of Acadia. He was sent to Nova Scotia about 1741. Through the spiritual hold he gained upon the Indians he was enabled to direct their operations against the English forts and settlements, and when the country was taken by the British, he contrived by threats of excommunication, or of massacre by his Indians, to terrify the simple Acadians into remaining loyal to King Louis, and covertly fighting for him after they had been subjects of King George for a generation. The misery he brought upon the people reached its climax when the long-suffering English Government ordered their deportation (1755). The Abbé Le Loutre had sought safety in flight at the surrender of Beauséjour, but he was coldly received by the Bishop and brethren at Quebec, and the ship in which he sailed for France was captured en route by the English, who held him prisoner for eight years in the Isle of Jersey. On his release he returned to his native land and died in obscurity.

LELY, lĕ′lĭ, Sir Peter (1618-80). A Dutch-English portrait painter (Pieter van der Faes), who practiced chiefly in England. He was the son of Johan van der Faes, alias Lely, a captain of foot in the service of the States-General. He was born at Soest—authorities differ whether the town in Westphalia or the village near Utrecht is meant. A pupil of Pieter de Grebber at Haarlem, in 1641, he went to England in the train of William, Prince of Orange, where his portraits of the latter and his bride, Princess Mary, made him well known. He remained in London, and in August, 1647, he painted the striking portrait of Charles I., now in Lion House, Isleworth. During the Commonwealth he painted the portrait of Cromwell (Pitti Gallery, Florence), and at the Restoration he was made Court painter by Charles II. He painted the royal family, the royal mistresses and their children, ministers, and generals. He was celebrated in the verses of Pope and other contemporaries, and Pepys notices him in his diary. Though very extravagant, he amassed a fortune, and was without a rival until the arrival of Kneller (q.v.). He was knighted in 1679, and died in London, November 30, 1680.

Lely's early works are modeled on Van Dyck, and are clear and warm in color, the hands being especially well drawn. In later life, when he had become popular, he employed assistants for the draperies and accessories, and his art degenerated. His color became cold and heavy, and his style mannered. He is chiefly famous for his portraits—the fair and frail beauties of the Court of Charles II. His best known work is the series of "Beauties," originally eleven in number, but now reduced to nine, painted for the Duchess of York. They are now at Hampton Court. Another well-known series is that of the "Admirals," twelve in number, painted for the Duke of York.

LEMAIRE, l*e*-mâr′, Jeanne Madeleine Colle (1845—). A French painter, born at Sainte Rosseline (Var). She was a pupil of her aunt, Mme. Herbelin, a miniature painter, and afterwards of Chaplin. Besides her portraits, her floral paintings are famous, and she made a great success at the Exposition of 1878 with her aquarelles. Some of her subjects are: "Improvisatrice vénitienne" and "Diane et son chien" (1869); "La sortie de l'église" (1872); "Mlle. Angot" and "La Marguerite" (1873); "Colombine" and "Le panier de roses" (1874).

LEMAÎTRE, l*e*-mâ′tr', Antoine Louis Prosper, known as Frédérick (1800-76). A celebrated French actor; born at Havre, July 28, 1800. He was educated at the Conservatoire, and in 1820 after acting at minor playhouses he appeared at the Odéon, but his fame began when in 1823 he created at the Ambigu the character of Robert Macaire in the melodrama of *L'auberge des Adrets.* His vigorous and original genius soon made him the idol of the boulevards, where he was the leading attraction in a succession of theatres. To the conventional restraints of the Théâtre Français, however, he could not accommodate himself. He represented on the stage the extreme of the Romantic School. Besides his character of Robert Macaire, which gave the name to a new drama of which Lemaître was joint author in 1834, the record of his achievements includes *Trente ans ou la vie d'un joueur* at the Porte Saint-Martin in 1827, Dumas's *Kean ou désordre et génie,* at the Variétés in 1836, Victor Hugo's *Ruy Blas,* at the Renaissance in 1838, and *Don César de Bazan* and *Toussaint l'Ouverture* later at the Porte Saint-Martin. His last appearance was in 1873, and he died in Paris on January 26, 1876. His career has recently been made the theme of a play by Clyde Fitch. Consult: *Souvenirs de Lemaître, publiés par son fils* (Paris, 1879); Duval, *Lemaître et son temps* (ib., 1876); De Mirecourt, "Frédérick Lemaître," in *Les contemporains* (ib., 1856); Lewes, *On Actors and the Art of Acting* (New York, 1878).

LEMAÎTRE, Jules (1853—). An eminent French critic of the subjective Impressionist School. He was born at Venncey (Loiret), began his career as a teacher at Havre (1875-80), then taught at Algiers (1880-82) and Besancon (1882-83), and was professor at Grenoble (1883-84). He was already author of two volumes of verse, and had published some essays and stories, when he resigned his post and gave himself altogether to letters. He went to Paris and in three months won by essays on Ohnet, Renan, and Zola a place that he has never since been in danger of losing. His *Impressions du théâtre* (9 vols., 1888 et seq.), and *Contemporains* (7 vols., 1886 et seq.), group his articles in two constantly extending series that treat criticism as "a representation of the world, like other branches of literature, and hence by its nature, as relative, as vain, and therefore as interesting as they." This profession of literary faith shows Lemaître to differ from Brunetière, much as Sainte-Beuve differed from Nisard in the preceding generation. The same unconventionality marks Lemaître's dramatic essays, some of which have been notably successful: *Révoltée* (1889); *Député Leveau* (1891); *Mariage blanc* (1891); *Les rois* (1893); *Flipote* (1893); *Myrrha* (1894); *Le pardon* (1895). Three volumes of collected tales, *Sérénus* (1886), *Dix contes* (1889) and *Les rois* (1893), cannot be said to have added anything to his reputation.

LEMAN, le-mäɴ′, Jacques Edmond (1829-84). A French painter, born at l'Aigle. He was a pupil of Picot, and made a success with his first exhibit at the Salon in 1852, "Les loisirs de Virgile." His more important paintings up to 1878 are: "Mort de Vittoria Colonna" (1853), now at Rome; "Duel de Guise et de Coligny" (1855); "Le repos de la Vierge" (1857); and "Une matinée à l'hôtel de Rambouillet" (1857). Afterwards he produced chiefly aquarelles, such as "Le doge de Génes (1879) and "La prise de possession de Cahors par les Anglais" (1880). His large historical piece, "Charlemagne dictant ses capitulaires," is in the tribunal of Bayeux.

LEMAN, Lake. See Geneva, Lake.

LE MANS, le mäɴ. A city of France. See Mans, Le.

LE MARS, lê märz. A city and the county-seat of Plymouth County, Iowa, 25 miles north by east of Sioux City; on the Illinois Central and the Chicago, Saint Paul, Minneapolis and Omaha railroads (Map: Iowa, A 2). It is the seat of Western Union College (United Evangelical), and has a public library. There is considerable trade with the surrounding farming and stock-raising region; and the manufactures include flour, blank books, drills, foundry and machine-shop products, brick, cigars, etc. Population, in 1890, 4036; in 1900, 4146.

LEMATTE, le-mät′, Jacques François Fernand (1850—). A French painter, born at Saint Quentin. He was a pupil of Cabanel, and in 1870 won the Prix de Rome, and made his first appearance at the Salon, with "Les joueuses d'osselets." His later paintings include: "La dryade" (1872); "L'enfant à l'opine" (1873); and the powerful "Oreste tourmenté par les Furies" (1876).

LEMBCKE, lĕmp′ke, Christian Ludwig Edvard (1815-97). A Danish poet, born at Copenhagen. He studied theology, became rector of a Latin school in Schleswig in 1850, and afterwards settled at Copenhagen, where he opened another institution of the same kind. He wrote several poems, among which is the popular *Vort Modersmaal* (Our Mother Tongue), but he is best known by his translation of Shakespeare (1861-70). He also translated Byron (1873-76).

LEMBERG, lĕm′bĕrk (Polish *Lwow*). The capital of the Crownland of Galicia, Austria, situated on the small stream of Peltew in a deep valley in a mountainous region, 212 miles by rail east-southeast of Cracow (Map: Austria, J 2). It is the third city in size of Cisleithan Austria. It is composed of the small old town, and of the four suburbs which contain most of the prominent buildings. The ramparts have been replaced by promenades, but the city has latterly been equipped with a citadel. Lemberg is very rich in ecclesiastical edifices. The chief among them are the Roman Catholic cathedral, built in late-Gothic style in 1350-1479 and adorned with frescoes; the Dominican church, modeled after Saint Peter's at Rome, and containing a monument to the Countess of Dunin-Borkowska by Thorwaldsen; the Armenian cathedral in the Armenian-Byzantine style; the United Greek cathedral in the basilica style; and the new synagogue. Lemberg has also eight monasteries and convents. The Rathaus, built in 1828-37, is surmounted by a tower 260 feet high and contains an industrial museum. Other prominent secular buildings are the hall of the Landtag, the Polytechnic Institute, the archiepiscopal palace, and the hospital. Prominent among the educational institutions of Lemberg is the university, founded by the Emperor Joseph II. The most noteworthy of the other educational institutions are the royal technical high school (one of the six in Austria) with an attendance of 700, five gymnasia, two theological seminaries, a school of agriculture and forestry, a normal training school, and several special schools. The Ossolinski National Institute contains collections of Polish historical and literary antiquities, portraits, and coins. The municipal museum has art and industrial collections, and the Dzieduszycki Museum is important to the student of ancient Galicia. In the Skarbek Theatre Polish-Italian operas are sung and Polish dramas performed.

Lemberg is the seat of the chief economic organizations of the crownland, and of archbishops of the Roman Catholic, United Greek, and United Armenian churches. It has large banks and commercial institutions. The transportation facilities include an electric railway. Lemberg manufactures farm machinery, boilers, various other iron products, musical instruments, brick, spirits, flour, etc. The trade, very extensive during the Middle Ages, was almost entirely destroyed by the fall of Poland. Within recent years the transit trade has somewhat recovered. The chief articles of commerce are agricultural products and some iron manufactures. The important fair of 'the three Kings' is held every January. Population, in 1890, 127,943; in 1900, 159,618. The larger part of the inhabitants are Poles and Roman Catholics, but there is also a considerable number of Jews, Germans, and Ruthenians. The foundation of Lemberg is usually attributed to the Ruthenian Prince Daniel, who built it for his son Leo, in whose honor it was named. Captured by Casimir the Great in 1340, it received Magdeburg rights, and greatly increased in importance under the Polish rule. It received many German colonists, and for two centuries the German language was used in its public records. It passed to Austria at the first partition of Poland in 1772.

LEMBERG, UNIVERSITY OF.' The third in size of the Austrian universities. As the centre of the Polish learning in Austria, it is a great factor in the Polish national movement, and its lectures, formerly given in German, are now all or nearly all in Polish. It was founded in 1784 by Emperor Joseph II., reorganized in 1817, and began to flourish especially after 1850. It has faculties of theology, law, and philosophy, besides instructors in medicine. Its library, founded in 1784, contains 160,000 volumes. Its budget for 1900 was 1,027,644 crowns, and the number of students 2060.

LEMER, le-mâr', JEAN BAPTISTE RAYMOND JULIEN (1815-93). A French author and publisher. He was born at Rochefort, and studied in Paris. He was a notary's clerk and then worked in a department of the Ministry of the Marine (1841-44). In 1848 he began to write for *La Semaine*, *La Liberté*, and *Le Courrier Français*, and soon after founded *La Sylphide* (1853), and *La Lecture* (1848). Under pseudonyms and his own name he published the erotic collections, *Poètes de l'amour* (1850) and *Lettres d'amour* (1852); *Le crime du 18 mars* (1871); *Le moulin de malheur* (1885); and *Balzac, sa vie, son œuvre* (1891).

LEMERCIER, le-mâr'syâ', JEAN LOUIS NÉPOMUCÈNE (1771-1840). A French dramatist and poet, born in Paris. Among the more noted of his dramas are *Tartufe révolutionnaire* (1795), *Agamemnon* (1794), *Ophis* (1798), *Charlemagne*, *Baudoin*, *Saint Louis*, names that suggest classic and historic subjects. He was, however, a reformer a little before the due time, preferring Shakespeare to Racine, and making experiments in stage naturalism, among them an imitation of the storm scene in *The Tempest*. He is interesting solely as a forerunner of the romantic drama. His poems (*Panhypocrisiade*, 1819; *Les âges français*, and others) are of slight worth. Consult Vauthier, *Essai sur Lemercier* (Paris, 1886).

LEMMA (Gk. λῆμμα, *lēmma*, a thing received, taken for granted, from λαμβάνειν, *lambanein*, Skt. *labh*, *rabh*, to take). In mathematics, a proposition introduced for the purpose of proving another proposition, but not otherwise connected with the general sequence. For example, in treating propositions on collinearity in geometry, in order to prove Pascal's 'mystic hexagram' theorem, "The opposite sides of a hexagon inscribed in conic intersect in three collinear points," it is convenient to approach the proposition through a theorem due to Carnot: "If a circumference intersects the sides a, b, c of a triangle ABC, in A_1 and A_2, B_1 and B_2, C_1 and C_2, respectively, then

$$\frac{AC_1}{C_1B}\cdot\frac{BA_1}{A_1C}\cdot\frac{CB_1}{B_1A}\cdot\frac{AC_2}{C_2B}\cdot\frac{BA_2}{A_2C}\cdot\frac{CB_2}{B_2A} = 1."$$

This latter theorem might, in this treatment of collinearity, be called a lemma. The word is not, however, much used at present, lemmas not being distinguished by name from other propositions in a sequence.

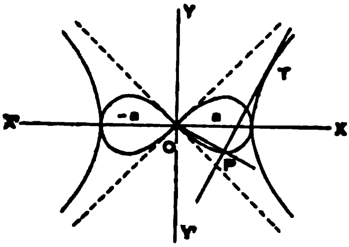
LEMMING (Norw., Swed., Dan. *lemming*, perhaps from Norw. *lemja*, to maim, but more probably from Lapp *loumek*, *lummik*, lemming). (1) A vole or short-tailed rat (*Myodes lemmus*) of the subfamily Arviculinæ, inhabiting the central mountain chain of Norway and Sweden. Lemmings are about five inches long, and yellowish-brown, marked with darker spots; and their food consists largely of birch shoots, mosses, grass roots and stalks, etc. In winter they form long galleries under the snow, in their wanderings in search of food. They make a nest in some sheltered place out of dry grass and hair, and there the young are born, two broods annually, with about five at a birth.

The circumstance which has made the lemming famous is its so-called 'migration,' the cause of which has never been satisfactorily explained. At intervals ranging from five to twenty or more years, lemmings suddenly appear in enormous numbers in cultivated districts of Norway and Sweden, where ordinarily they do not occur, traveling seaward and not deterred by any obstacle. They swim the streams and lakes which may lie in their path and keep persistently onward, until finally the survivors reach the sea, into which they plunge and so ultimately perish. During this migration all sorts of predatory animals follow in their wake, feasting on the unusual abundance of food, while men also slaughter them, as the damage they inflict on cultivated fields is serious. (See Plate of GOPHERS.) (2) Besides the Norwegian lemming, several related animals are given the same name. One of these (*Myodes Obensis*) inhabits the Arctic regions of both hemispheres and is very abundant in Northwestern America. It is bright rusty-brown in color and is not known to make migrations. Another species (*Myodes schisticolor*) inhabits Siberia and is plain slate-gray. A closely related animal, the banded lemming or hare-tailed rat or mouse, is *Cuniculus torquatus*; it is found in the Hudson Bay country and Greenland, and is remarkable for turning white in winter. The 'false' lemming represents a third nearly related genus, the single species of which, *Synaptomys Cooperi*, occurs from Indiana and Kansas northwestward to Alaska. Other

American rodents known as 'lemmings' are *Lemmus trimucronatus* and *Dicrostonyx Richardsoni.* For these American mice, consult Preble, "A Biological Investigation of the Hudson Bay Region," *North American Fauna,* No. 22 (Washington, 1902), and other publications in the same series.

LEM′NIAN EARTH. A soft, yellowish-gray, hydrous aluminum silicate that is found in amorphous masses on the island of Lemnos, now Stalimene. It was valued as a medicine among the ancients, who stamped it with the head of Diana, the tutelary goddess of Lemnos; whence it acquired the name of *terra sigillata* (sealed earth), and was used as an antidote for poison and the plague. It corresponds to the mineral cimolite.

LEMNIS′CATE (Neo-Lat. *lemniscata,* from Lat. *lemniscatus,* ribboned, from *lemniscus,* from Gk. λημνίσκος, *lēmniskos,* ribbon, from λῆνος, *lēnos,* wool). A curve defined as the locus of a point which moves so that the product of its distances from two fixed points is constant and equal to the square of half the distance between the fixed points. It may also be defined as the locus of the intersection of the normals from the origin with the tangents to an equilateral hyperbola. If the equation of the hyperbola is $x^2 - y^2 = a^2$, the equation of the lemniscate is $(x^2 + y^2)^2 = a^2(x^2 - y^2)$. The lemniscate is a special case of the Cassinian ovals (q.v.), and its shape resembles that of the figure 8. Its polar equation is $\rho^2 = a^2(\cos^2\theta - \sin^2\theta) = a^2 \cos 2\theta$. The curve is symmetric with respect to both coördinate axes, tangent to the asymptotes of the hyperbola of the origin, and lies between the lines $x = -a$, $x = a$, and is of the fourth order and of the eighth class. (See CURVE.) The lemniscate was invented by Jakob Bernoulli (*Acta Eruditorum,* 1694). Fagnano (1750) discovered its principal properties, but the analytic theory is due chiefly to Euler.



LEMNISCATE.

The curves obtained by tracing the loci of the intersection of the normals from the origin with the tangents of curves, other than hyperbolas, are also sometimes called lemniscates; e.g. the curve resulting in case the ellipse is taken as the base is called an elliptic lemniscate. For an extensive bibliography of the lemniscate, consult Brocard, *Notes de bibliographie des courbes géométriques* (Bar-le-Duc, 1897).

LEMNIUS, lĕm′nĭ-o͞os, SIMON (c.1510-50). A German humanist, whose real name was Simon Lemm Margadant; from this family name he was sometimes called Emporicus or Mercatorius. He was born at Münsterthal; probably studied at Munich and Ingolstadt and under Melanchthon at Wittenberg. His earliest work, published at Wittenberg in 1538, *Epigrammaton Libri Duo,* united invective against many of Luther's followers with eulogy of Luther's enemy, the Archbishop and Elector Albrecht. Lemnius had to leave Wittenberg; but in 1538 he published, probably at Halle, a third book of *Epigrammata.* This was answered by Camerarius's *Elegiæ, ὀδοιπορικαί,* and that in turn by an *Apologia* from Lemnius (1542). But his bitterest attack was in the poem *Latii Pisæi Juuenalis Monachopornomachia,* which is of uncertain date. In 1540 he was appointed teacher in the new Nikolaischule at Chur, where he died in 1550. His writings, besides those already mentioned, are: *Bucolicorum Æclogæ Quinque* and *Amorum Libri Quatuor* (1542); *Homeri Odyssea Heroico Versu Facta, Accedit Batrachomyomachia* (1549); and another version in Latin of Dionysius's *Periegesis* (1543) and a *Rhæteïs,* printed first in 1874. Consult: Lessing, *Kritische Briefe* (Berlin, 1753); Plattner, in his edition of the *Rhæteïs* (1874); and Strobel, *Neue Beiträge zur Litteratur* (Nuremberg, 1792).

LEM′NOS (Gk. Λῆμνος). One of the four Thracian islands in the northern part of the Grecian Archipelago, about forty miles west of the entrance to the Dardanelles. It is irregular in shape, and is nearly divided by two deep bays—Port Paradise on the north and Port Saint Anthony on the south. Area, 150 square miles. Population, about 30,000. It is hilly, rather bare of wood, but produces grain, tobacco, and fruits. The inhabitants are peaceable and prosperous. The island has been for some time used as a place of exile for political offenders in Turkey. The principal product of Lemnos was formerly the *Lemnian earth* (q.v.), used in ancient and mediæval times as a cure for wounds and serpent-bites, and until recently highly valued by both Turks and Greeks, but the ceremonies with which the earth was extracted have been discontinued, and even the knowledge of the earth is likely to be forgotten. The chief town, Kastro (on the site of the ancient Myrina), has a population of 3000. It furnishes excellent sailors. Owing to its situation, Lemnos long remained but little influenced by the Greeks. Judging from an inscription found on the island, the pre-Hellenic population were akin to the Etruscans. It was conquered for Athens by Miltiades, the tyrant of the Chersonese, occupied by the Persians, and again seized by the Athenians along with Imbros, and settled by Athenian colonists. The island was of great importance to Athens, as its possession secured control of the trade from the Black Sea, and it was recognized as Athenian territory by the Peace of Antalcidas. During the Hellenistic and Roman periods the island was not prominent, and it continued under the rule of the emperors of Constantinople until the capture of that city by the Latin crusaders, when it passed under the control of the Genoese princes of Mitylene. Later it fell into the hands of the Venetians, and in 1478 was surrendered to the Turks. The ancient writers speak of the island as volcanic and Mount Moschylos as active, and the place was a centre of the worship of Hephæstus. At present there seem to be no evidences of volcanic action, and it is probable that the volcano has sunk in the sea, and is now represented by a shoal off the eastern coast. Consult: Conze, *Reisen auf den Inseln des thrakischen Meeres* (Hanover, 1860); Tozer, *Islands of the Ægean* (Oxford, 1890); de Launay, *Chez les Grecs de Turquie* (Paris, 1897).

LE MOINE, le mwăn. The name of several French-Canadian pioneers. See LE MOYNE.

LE MOINE, Sir JAMES MACPHERSON (1825 —). A Canadian author and naturalist, born in Quebec. He was educated at Le Petit Séminaire de Québec, and was admitted to the bar in 1850. In 1847 he entered public service as Collector of Inland Revenue at Quebec, and in 1869 he became inspector. His writings on early Canadian history have gained him a reputation for carefulness of research and for impartiality. He devoted much time to the study of natural history, particularly ornithology, and his contributions in this field also have acquired more than ordinary reputation. He was knighted in 1897. His many publications include: *L'ornithologie du Canada* (1860); *Legendary Lore of the Lower Saint Lawrence* (1862); *Les pécheries du Canada* (1863); *Maple Leaves* (1863-94); *The Tourist's Note Book* (1870); *Quebec, Past and Present* (1876); *The Scot in New France* (1879); *Chronicles of the Saint Lawrence* (1879); *Picturesque Quebec* (1882); *Monographies et esquisses* (1885); *Canadian Heroines* (1887); *Birds of Quebec* (1891); and *Conférences et mémoires: Histoire, archéologie* (1882-90).

LEMOINNE, le-mwän′, JOHN EMILE (1815-92). A French editor and publicist, born in London, October 17, 1815. He was educated first in England, then in France, and employed in the Ministry of Foreign Affairs. In 1840 he became editor of the *Journal des Débats,* and held the post for more than half a century, writing especially on foreign politics and English institutions. He displayed great satiric powers. He became an Academician in 1875 and life member of the Senate in 1880. His numerous publications were of ephemeral interest. He died in Paris December 14, 1892.

LEMON (older forms also *lemmon, limon, lemond,* from Fr. *limon,* ML. *limo,* from Ar. *līmūn,* from Pers. *līmūn, līmū,* lemon), *Citrus Medica,* var. *limon.* The common lemon-tree or its fruit. The tree is of irregular growth, inclined to make long leaders, clothed sparsely with foliage, and of an average height of 10 to 20 feet. The flowers are purplish on the outside, and their fragrance is less marked and agreeable than that of the orange. The fruit is botanically a berry, ellipsoidal in form, and usually knobbed at the apex or distal end; it is of a light yellow color, and its rind is well charged with oil-glands carrying an abundant store of oil. Lemon oil, or extract, is extensively derived from this source, either by expression or distillation, the former process being the common one. The pulp of the lemon is light-colored and well charged with a juice of agreeable flavor, which is mainly due to the citric acid. It is much used by calico-printers to discharge colors, to produce greater clearness in the white part of patterns dyed with dyes containing iron. Citric acid and lemon-juice are also made from it in commercial quantities.

The lemon is found wild in India, from whence it was early transported by the Arabs. It reached Europe probably not earlier than the Crusades. It is now extensively cultivated in Italy and the adjacent islands, in Spain and Portugal. In the United States it is planted in Florida and California, but as it is less hardy than the orange, it is confined to a more restricted area. Since the severe freeze of 1894-95 lemon culture in Florida has been almost entirely transferred to the southern frost-free counties of the State. The soil here is less suited to the plant, and greater skill in mulching and fertilizing is necessary. Orchards are usually planted with trees grown from the bud on the sour orange as a stock, although *Citrus trifoliata* can be used. The lemon grows from cuttings, as do the lime and the citron. The orchard treatment of the lemon is the same as for the orange (q.v.). The lemon is very different from the orange in its habit of growth, being more inclined to assume the character of the pear, producing long branches with the fruit at or near the extremity. Close attention to heading-in is, therefore, a necessity in order to insure the fruit against injury and loss by the wind, as well as for ease in gathering the product.

Since the lemon naturally ripens in winter, since fruits allowed to mature on the trees do not keep well, and since the great demand for lemons is during the summer months, in order to insure a supply at the desired season the fruit is gathered when it has attained a standard size, though still in a partially developed state. It is kept in dark, cool rooms, where extremes of temperature and draughts can be prevented. When conditions are right the immature fruit ripens slowly, loses moisture, and the rind becomes then tough and pliable. Such fruits keep and ship well. When removed from the curing-room they are assorted, graded, wrapped in tissue paper, and packed in boxes like those used for oranges. The profit from lemon culture is large. Lemon-growing in America extended so rapidly during the last quarter of the nineteenth century that the home demand is well supplied. California alone averages an annual crop of about 1200 carloads. See Plate of CITRUS FRUITS.

LEMON, MARK (1809-70). An English journalist and author, the founder and editor of *Punch.* He was born in London, November 30, 1809. His only schooling was at Cheam, in Surrey. When hardly more than a boy he began contributing tales and verse to the magazines. In 1835 the first of his many popular farces was performed at the Strand Theatre. In the course of his long career he was connected with *Household Words, Once a Week,* the *Illustrated London News,* and the *London Journal.* He wrote fairy tales, Christmas stories, and longer novels, as *Faulkner Lyle* (1866) and *Leyton Hall* (1867). He was also a successful lecturer and amateur actor. In conjunction with Henry Mayhew (q.v.) he founded *Punch,* the first number of which appeared July 17, 1841. From 1843 till his death he was sole manager. He gathered about him the best humorists of his time, among whom were Douglas Jerrold and Thackeray. Under his management *Punch* became an organ of immense social influence. He died at Crawley, in Sussex, May 23, 1870. His well-known *Jest Book* was reprinted for the Golden Treasury series (1892). Consult Hatton, *With a Show in the North: Reminiscences of Lemon* (London, 1871).

LEMON-GRASS (so called from the lemon-like fragrance). *Andropogon schœnanthus.* A beautiful perennial grass, three or four feet high, with a panicle mostly leaning to one side, and spikelets in pairs, or, if terminal, in threes. It is a native of India, Arabia, etc., and is extremely abundant in many places. It is too coarse to be relished by cattle except when young, and is therefore often burned down. Europeans in India make an agreeable stomachic and tonic tea of the fresh leaves. By distillation, a yellow essential oil, with a strong lemon-like smell, is obtained (lemon-grass oil), which is employed externally as a stimulant in rheumatic affections. It is used in perfumery, and is often called oil of verbena by perfumers. Lemon-grass has been introduced into the West Indies, Australia, etc. See ANDROPOGON.

LEMON-JUICE. A somewhat turbid sour liquid, obtained from lemons by expression and straining. Its acidity is due to the presence of citric acid, which it contains both free and in the form of salts; it also contains some sugar, gum, and inorganic salts. Its physiological action is usually the same as that of citric acid, to which, however, it is generally preferred as a remedy for scurvy. Lemon-juice is much used for making effervescent drinks. See CITRIC ACID.

LEMONNIER, le-mô'nyâ', ANTOINE LOUIS CAMILLE (1835—). A Belgian novelist, born at Ixelles, near Brussels. His earlier writing was in the field of art criticism, such as *Les salons de Bruxelles* (1863-66), *Salon de Paris* (1870), and *Les peintres de la vie* (1888). *La Belgique* (1887) received a prize from the Belgian Government. His other works are novels, mostly of the Realistic School, such as *Contes flamands et wallons* (1873); *Un coin de village* (1879); *Les charniers,* based on the battle of Sedan (1881); *Happe-Chair,* much the same story as Zola's *Germinal* (1886); and the serial *L'enfant du crapaud,* the publication of which in *Le Gil Blas* (1889) was stopped and its author fined one thousand francs for immorality. His stories for children include *Bébés et joujoux* (1880), *La comédie des jouets,* and *Les histoires de huit bêtes et une poupée* (1888). His later novel, *Au cœur frais de la forêt* (1900), has none of the brutality of his earlier work, and is marked by unusual descriptive power.

LE MONNIER, PIERRE CHARLES (1715-99). A French astronomer. He was elected a member of the Académie des Sciences in 1736, and in the following year was associated with Maupertuis and Clairaut, at Torneå, in measuring a degree of the meridian in Lapland, within the polar circle. In 1739 he was elected honorary member of the Royal Society of London, and for twelve years was its senior member. In 1741 he published *Histoire céleste.* In 1746 and 1748 he made some successful telescopic observations in relation to the planets Jupiter and Saturn, and an eclipse of the sun. He held the chair of physics in the Collège de France for many years. In 1746 he published *Institutions astronomiques,* an elementary work. In 1748 he went to England, and thence to Scotland to observe the solar eclipse. In 1771 he published *Nautical Astronomy,* and various treatises on navigation, magnetism, and the variations of the compass, etc.

LEMON OIL. A volatile oil expressed from lemon-peel and consisting chiefly of the hydrocarbons citrene ($C_{10}H_{16}$) and cymene ($C_{10}H_{14}$), and the aldehyde citral or geranial ($C_{10}H_{16}O$). Oil of lemon is a fragrant yellow liquid, miscible in all proportions with absolute alcohol and glacial acetic acid. It is principally used for the purpose of communicating an agreeable odor to other medicinés, although it is sometimes taken in the dose of two or three drops on sugar as a carminative. Because of its agreeable scent, it is often added to evaporating lotions and to ointments.

LEMONS, SALT OF. A name commonly but improperly applied to acid potassium oxalate.

LE MOYNE, le mwän, ANTOINE, Sieur de Châteauguay (1683-1747). A Canadian officer, and the youngest of the sons of Charles Le Moyne, Sieur de Longueuil. He became an officer in the French army, and in 1704 led a party of settlers to the Colony of Louisiana, which had been founded by his brother, Iberville (q.v.). During the next two years he served under his brother against the English, and with such distinction that in 1717 he was given command of the French troops in Louisiana. He served against the Spaniards in the Florida campaign of 1719. From 1720 to 1726 he was stationed at Mobile, then recalled to France and sent as Governor to Martinique, and later to Cayenne. He was made Governor of Cape Breton in 1745, a year famous in the annals of that station on account of the capture of the fortress of Louisburg (q.v.) by the New England forces under William Pepperell.

LE MOYNE, CHARLES, Sieur de Longueuil (1626-83). A Canadian explorer. He was born in Normandy, and when fifteen years of age emigrated to Canada, where he and his family of eleven children took part in the early settlement of the country. He distinguished himself in the Indian wars, where he passed through many thrilling adventures, and for his services was ennobled by Louis XIV., becoming Seigneur de Longueuil in 1668, and later receiving the additional title of Châteauguay. He was for many years Captain of Montreal. He died at Villemarie, Canada.

LE MOYNE, CHARLES, first Baron de Longueuil (1656-1729). A Canadian soldier, son of Charles Le Moyne, Sieur de Longueuil, and brother of several other famous soldiers and explorers. He served in the French army in Flanders, but becoming interested in colonization, returned to Canada in 1683, and devoted himself to developing the resources of that country. He took a prominent part in the defense of Quebec against the English in 1690, was Governor of Montreal in 1700, and fought against Walker's expedition of 1711, in which year he was appointed commandant-general of Canada. In 1726 he obtained from the hostile Iroquois a concession to rebuild the important fort at Niagara, commanding the lower lakes, and was engaged in this work at the time of his death.

LE MOYNE, JACQUES, Sieur de Sainte Hélène (1659-90). A Canadian army officer, and the second son of the elder Charles Le Moyne. Sieur de Longueuil. He distinguished himself in an expedition against the English posts on Hudson Bay (1686), on which occasion three forts, a war-vessel, and the Governor-General were captured. He also was prominent in the massacre at Schenectady in 1690, and was mortally wounded the same year at Quebec, in defending that city against the attack of the English under Admiral Phipps.

LE MOYNE, JEAN BAPTISTE, Sieur de Bienville (1680-1768). A son of Charles Le Moyne, Sieur de Longueuil, and celebrated as one of the colonizers of Louisiana. See Bienville.

LE MOYNE, Joseph, Sieur de Sérigny (1668-1734). A Canadian officer and explorer, sixth son of Charles Le Moyne, Sieur de Longueuil. He served against the English in the Hudson Bay country in the early part of his career, but the French possessions to the south were the scene of his most noted exploits. He went with his brother Iberville (q.v.) to Louisiana, and made a study of the Gulf coast. For gallant action against the Spaniards at Pensacola and at Mobile, he was in 1723 promoted to be rear-admiral and Governor of Rochefort, in France, where he passed the remainder of his life.

LE MOYNE, Paul, Sieur de Maricourt (1663-1704). A Canadian soldier and explorer, fourth son of Charles Le Moyne, Sieur de Longueuil. He became an officer in the French army of Canada, and took a prominent part in colonial affairs, his success being largely due to his ability to deal with the Indians. He saw active service against the English in the Hudson Bay expedition of 1686 with his brother Iberville (q.v.), and in the attack on Quebec in 1690. In 1701 he negotiated a peace with the Iroquois at the close of Frontenac's expedition against them. He was killed in an Iroquois raid upon the stockade fort where he was stationed.

LE MOYNE, Pierre, Sieur d'Iberville (1661-1706). A son of Charles Le Moyne, Sieur de Longueuil, and one of the colonizers of Louisiana. See Iberville.

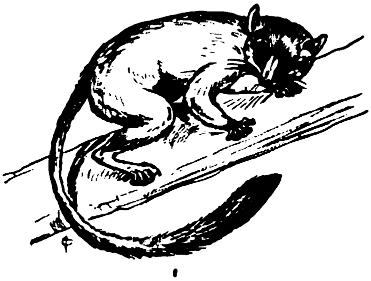
LEM'PA. The principal river of Salvador, Central America. It rises in Lake Guija on the boundary of Guatemala, and flows east and south through a fertile and well-populated region, emptying into the Pacific Ocean (Map: Central America, C 3). It is the largest river on the Pacific coast of Central America. Its length is 200 miles; it is navigable for 100 miles for small steamers.

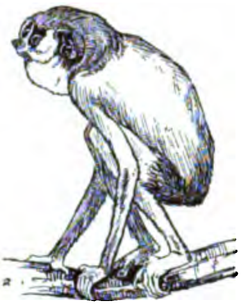
LEMPRIÈRE, lĕm-prĕr′, John (c.1765-1824). An English classical scholar. He was born in the island of Jersey, and studied at Westminster School and at Pembroke College, Oxford, receiving the degree of B.A. in 1790. After taking orders, he became headmaster of schools in Abington and Exeter, and later rector of Meeth (1811) and of Newton-Petrock, Devonshire (1823). He is best known as the author of a classical dictionary, the *Bibliotheca Classica* (Reading, 1788; last edition, 1888), which was afterwards frequently reprinted in England and in this country. It was founded upon Sabatier's great *Dictionnaire des auteurs classiques* (1766-90), and was itself used by Anthon as the basis of his classical dictionary. Other published works of Lemprière are: *Sermons* (1791); a translation of *Herodotus*, first volume only (1792); and a *Dictionary of Universal Biography* (London, 1808), enlarged and reprinted by Lord (New York, 1825).

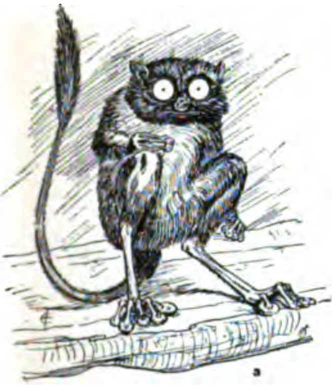
LEMUR (Lat. *lemur*, ghost). Of the many curious animals characteristic of Madagascar, lemurs are perhaps the most interesting. The name was originally bestowed by Linnæus on account of the nocturnal habits and peculiar ghost-like appearance of the species known to him, and it is still used as the name of the typical genus of the group. But at the present time it is not easy to determine whether all the animals of the suborder Lemuroidea are to be called lemurs or not. The lemuroids (suborder Lemuroidea) differ from all the other primates in certain peculiarities of the skull, hands, and feet, and in the simple structure of the brain, in which the cerebral hemispheres are little convoluted and do not conceal the cerebellum. Yet there is rudimentary 'simian fissure.' They stand at a lower level than other primates. The head lacks the human expression of the anthropoid apes or even of many monkeys—is more fox-like. The long tail in such as have it is never prehensible, nor is there ever any trace of cheek-pouches or of integumental callosities. A curious contrast exists between the monkeys and the lemurs, as Beddard points out, in respect to the digits of the hands and feet. In the former it is the hallux or pollex which is subject to great variation, but in the lemurs the thumb and great toe are always well developed, although the second or the third digit constantly shows some abnormality, such as the remarkable elongation of the third digit in the aye-aye (q.v. for illustration) and in the absence of the index in the potto. In all lemurs, moreover, a sharp claw is borne upon the second toe, unlike the other flat 'nails.' The dentition is peculiar in the way the incisors (four in each jaw) are enlarged and project forward, and in the incisor form of the lower canines. There are also important peculiarities in the visceral anatomy. The stomach is simple; the cæcum is always present and of variable lengths, but never has a vermiform appendix. Some of the arteries break up into 'retia mirabilia,' not known elsewhere among primates, but a characteristic of edentates; and a still more remarkable contrast with other primates is the fact that among lemurs the placenta is non-deciduate.

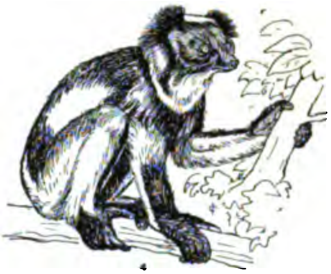
The geographical distribution of the lemurs is extraordinary and has given rise to much speculation. (See Lemuria.) Two-thirds of the group are confined to Madagascar and near-by islands, where their perpetuation as a race may be due to the scarcity of carnivores; the remainder belong to Ethiopia and the Oriental region; but in past ages they were widespread in Europe, Asia, and North America. The Lemuroidea fall very naturally into three families, Lemuridæ, Tarsiidæ, and Chiromyidæ. The last two, however, contain only a single species each, the tarsier and the aye-aye (qq.v.), and these are such curious animals that it is more natural not to call them lemurs. The family Lemuridæ includes some thirty-five or forty species, which are quite generally grouped in four subfamilies, of which the first includes the indris and avahis of Madagascar; the second, the true lemurs; the third, the chirogales of Madagascar and the galagos of Africa; and the fourth, the loris of Ceylon, India, and Southeastern Asia, and the angwantibo (or awantibo) and potto of West Africa. The indris is one of the largest species, but the avahis or woolly lemur (*Avahis laniger*) is a small, solitary, and nocturnal species, slow in its movements and rarely descending to the ground. The mouse-lemurs or chirogales (genus Chirogaleus) are remarkable little creatures, long-tailed and nocturnal; some of the species build nests like those of birds, while others are notable for spending the dry season in a state

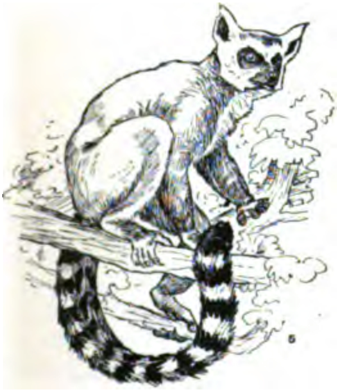
LEMURS

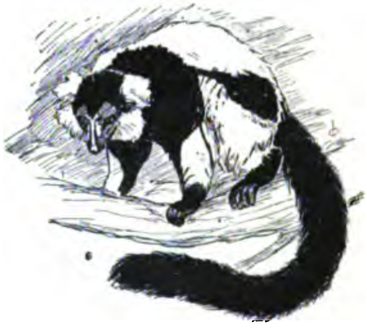


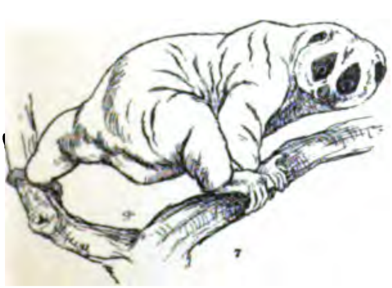


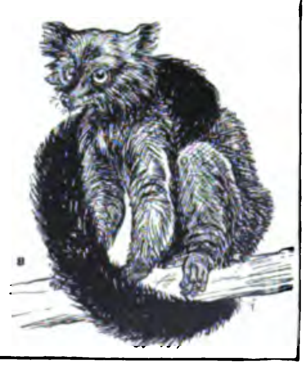












1. MOUSE LEMUR (Cheirogaleus murinus).
2. SLENDER LORIS (Loris gracilis).
3. TARSIER (Tarsius spectrum).
4. INDRI (Indris brevicaudata).
5. RING-TAILED LEMUR (Lemur catta).
6 RUFFLED LEMUR (Lemur varius).
7. SLOW LEMUR or COMMON LORIS (Nycticebus tardigradus).
8. BLACK LEMUR (Lemur macaco).

of torpidity, in a hollow in a tree, great quantities of accumulated fat providing the necessary nourishment. The galagos (genus Galago) have large, round, naked ears, which the animal can fold at will; they are small, beautiful, active nocturnal animals, with large eyes, long tails, and soft woolly fur. The loris and pottos are remarkable for the slowness of their movements and the small or rudimentary index-finger.

The true lemurs are characterized by having thirty-six teeth, long tails, moderately elongated tarsus, and short cæcum. They are confined to Madagascar and the adjacent Comoro Islands. They vary in size from that of a cat to that of a small squirrel, with fox-like faces and soft, thick fur. They walk on the ground or run about on the limbs of trees on all fours, but they are capable of very agile jumping. They are diurnal, but most active toward evening, and are very noisy, as they go about in small troops; only two or three species are nocturnal or solitary. They are omnivorous and eat insects and birds' eggs, as well as buds and fruit. At rest, the tail is usually coiled around the body for warmth. Only one or two young are born at a time, and they are carried about by the mother, at first on her front (the mammæ are pectoral), but later on her back. Lemurs are easily kept, and often breed in captivity, and are common in menageries. They are very variable in color, and for that reason the validity of many species is open to question. The most beautiful is the ring-tailed lemur (*Lemur catta*), or 'Madagascar cat,' which is gray, with the long tail marked with alternate black and white rings. Like the others it is locally distributed—not scattered generally all over the island, but only where the environment is suitable. This species lives only on slippery seaside cliffs, where it scrambles about rocks where not even barefooted men can walk, its long, smooth, leather-like palms enabling it to go safely. It feeds almost wholly on the fruit of the prickly pear in winter, stripping off the spinous skin by means of the long canine teeth. In summer it eats wild figs and bananas mainly. It may be easily tamed and taught to live upon cooked rice and the like, but will take no meat. These lemurs use their teeth as weapons, but also strike with their hands, and will put to flight dogs larger than themselves.

The broad-nosed lemur (*Hapalemur griseus*, or *simus*) lives only among bamboos, whose young shoots form its principal fare; it also eats grass and sugar-cane. This genus is remarkable for a spine-bearing gland on the forearm. Many lemurs have strange processes upon the skin, the purpose of which is not clearly understood. The color of some species varies with sex, as *Lemur macaco*, the male of which is black and the female red. The ruffed lemur (*Lemur varius*) is the largest of the race. It inhabits Northeastern Madagascar, and, as its name implies, is remarkable for its variation in color, some being black and white in patches variously disposed, others reddish brown or red and black. The hair on the neck forms a high ruff.

Lemurs are all perfectly harmless, but their big eyes, weird actions (in some cases), and often loud and strange nocturnal cries have led to their being regarded with superstition by the ignorant, especially in the Oriental countries. Much folk-lore and superstition has therefore gathered about many species. Consult, on this point, Flower, *Proceedings of the Zoölogical Society of London* for 1900, p. 231.

See PRIMATES; AYE-AYE; GALAGO; MOUSE-LEMUR; POTTO; and other names of particular species. See Plate of LEMURS.

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LEM'URES (Lat. nom. pl., ghosts). Among the Romans of historic times, the same as *larvæ*, that is, the souls of the departed, especially of ancestors who hovered about during the night and required propitiation. It is very probable that the word is derived from the name of the festival. The festival called *Lemuria* was held on May 9, 11, and 13, and at midnight of each day the father of the family, with special ceremonies, nine times threw black beans over his head, thus, as was supposed, banning the ghosts from the house for another year. Ovid describes *Lemuria* in *Fasti* v., 419 ffg.

LEMURIA (Neo-Lat., from Lat. *lemur*, ghost). In zoölogy, a hypothetical continent, now largely covered by the Indian Ocean, which was proposed by Haeckel as an area of ancient land characterized prominently by being inhabited by lemuroid animals. The object of the hypothesis was to account for the fact that now lemurs inhabit the widely separated regions of Madagascar and the Malayan islands. The more recent evidence from paleontology that the earliest lemurs inhabited America destroys both the logical basis of, and the need for, such a hypothesis. Consult Wallace, *Geographical Distribution of Animals* (New York, 1876). See LEMUR.

LENA, lā'nȧ. The easternmost of the three great rivers of Siberia and the chief waterway of Eastern Siberia (Map: Asia, M 2). It rises on the slopes of the Baikal Mountains, west of Lake Baikal, and 186 miles northeast of Irkutsk. It flows first in a general northeastern direction to the town of Yakutsk, after which it flows northwest and then northward. It falls into the Arctic Ocean about longitude 127° E., forming a vast delta consisting of seven principal and numerous secondary arms. Its total length is estimated at 3000 miles. The upper course of the river, from its rise to its junction with the Kuta (about 430 miles), at which point it becomes navigable for steamers, is through a mountainous region. Its banks are partly rocky and barren and partly covered with thick forests; its course is swift. There is very little agricultural land along the upper course, and the chief occupations of the adjacent settlements are fishing and hunting. The middle stream, from the mouth of the Kuta to its junction with its chief tributary, the Aldan (over 1400 miles), is much wider and has on the whole the appearance of a navigable river. The banks are partly lined with mountain masses of red sandstone, and numerous reefs and islets render navigation hazardous. Below Yakutsk the Lena throws off a number of arms, forming long, narrow islands, and the banks become lower and the course of the river much slower. The country along the middle course of the Lena is very sparsely inhabited by Yakuts.

In the lower middle course of the river the banks are precipitous and thickly wooded, while toward the delta they become barren and covered with masses of rocks, among which snow remains even during the summer, and here there are practically no permanent settlements. The inclosed islets of the delta are flat and covered only with hardy grasses and moss. On a rocky promontory of one of the inclosed islands, known as Monument Cape, stands a wooden cross commemorating the victims of the *Jeannette* expedition buried there. The Lena is frozen at Kirensk (at the beginning of its middle course) from the end of October to the end of April; at Yakutsk from the middle of October to the end of May; and at the delta from the middle of September to the middle of June. The opening of the river is accompanied by disastrous floods. Steam navigation, first introduced on the Lena in 1862, is confined chiefly to the upper part of the river and its tributaries, freight (chiefly minerals, fish, and grain) being carried principally in barges and wooden vessels built in the shipyards on the upper course, where shipbuilding is the chief industry. The principal ports on the Lena are Verkholensk, Vitimsk, Olekminsk, Yakutsk, and Bulun. The Lena has numerous tributaries, of which the most noteworthy are the Kirenga, the Vitim, the Olekma, and the Aldan from the right and the Viliuy from the left. The river is rich in fish, but its fishery industries are still undeveloped and are mostly in the hands of the Yakuts. Some of the tributaries of the river abound in gold, and the region along the river is highly mineralized in some parts. The Lena was discovered by the Russians in 1628.

LENÆ'A (Lat., from Gk. *Λήναια*, *Lēnaia*). The Feast of Vats, one of the series of festivals constituting the Dionysia, held during the month of Gamelion (January-February) at the Lenæum at Athens. The festival consisted of a public feast, followed by dramatic performances at the theatres, to which the participants went in procession.

LENARD RAYS. See ELECTRICITY, paragraphs *Discharge Through Gases.*

LENARTOWICZ, lĕn'är-tō'vĭch, TEOFIL (1822-93). A Polish poet, born at Warsaw and educated there. He lectured on Polish literature at Bologna for a time, then went to Rome, and afterwards lived in Florence. His best-known poems are *Szopka* (1849), *Lirenka* (1851), *Nowa lirenka* (1857), *Poezje* (1861), and the idyl *Jagoda z mazovieckich lasóf* (1880). They are passionately patriotic, and descriptive of quiet rural life. He translated Dante's *Divina Commedia* into Polish.

LENAU, lā'nou, NIKOLAUS (1802-50). A name assumed by Nikolaus Niembsch von Strehlenau, an Austrian lyric and elegiac poet. He was born at Csatád, Hungary, studied law and then medicine at Vienna, but he never practiced either profession. His genius first found expression in *Gedichte* (1831), full of sadness and exquisitely melodious. He then went to Stuttgart and associated with poets of the Swabian school, especially Kerner, Schwab, and Karl Mayer. Growing restless there, he went to America in 1832, traveled on horseback in what was then the West, and returned, disillusioned by experience, in 1833, to find himself already poetically famous as the lyric representative of an emotional period of political transition. The next ten years were passed at Vienna and in Swabia. *Faust* (1835) showed even more than the poems of 1831 a nature at strife with itself, with the world and God, and a genius careless of conventional form. It is a fragmentary poem, wavering between epic and dramatic, but abounding in brilliant scenes. In the same year he published *Neuere Gedichte* (2d enlarged edition 1840). *Savonarola* (1837; 5th ed. 1856) and *Die Albigenser* (1842; 4th ed. 1873) are to be regarded rather as fragments than as literary entities. *Don Juan* (1851), a sort of drama, was left unfinished at his death. Lenau's finest poems are descriptive of Hungarian life and scenery. Soon after 1844 he became insane. The rest of his life was passed in the asylum at Oberdöbling, near Vienna. He died August 22, 1850. His *Sämmtliche Werke* were edited by Anastasius Grün (in 4 vols., Stuttgart, 1855; 2 vols., 1881). There is a later edition with life and notes (Leipzig, 2 vols., 1882), and another (2 vols., Berlin, 1883). Consult: Schurz, *Lenaus Leben* (2 vols., Stuttgart, 1855); Frankl, *Zu Lenaus Biographie* (2d ed., Vienna, 1885), and his edition of *Lenau und Sophie Löwenthal, Tagebuch und Briefe des Dichters* (Stuttgart, 1892).

LENBACH, lĕn'bäG, FRANZ VON (1836-1904). A German portrait painter, the greatest of the nineteenth century. He was born at Schrobenhausen, in Upper Bavaria, December 13, 1836. When a boy he worked as an apprentice to his father, a master mason. His first artistic effects were all taken directly from nature, and a brief period of study at the Polytechnic School of Augsburg only served to instill in him a lifelong hatred for art academies. Two months' work under Gräfle at Munich increased this dislike. He worked for himself in his native village until in 1857 he became a pupil of Piloty at Munich. His first work to attract attention was "Peasants Taking Refuge from a Storm in a Chapel" (1857), now in the Magdeburg Museum. It reveals the influence of Piloty, but contains a powerful naturalism unknown to that master. During the same year he accompanied Piloty to Italy, where he had occasion to study more thoroughly the old masters, whom he already revered. One of the results of this journey was his "Arch of Titus," in 1858, now in the Museum of Pressburg, the vivid realism of which caused much commotion. Equally powerful is his "Shepherd Boy" (1860), in the Schack collection, Munich. In 1860 he was called, together with Böcklin and Reinhold Begas, to teach in the new art school at Weimar, but remained only a year and a half.

The most important influence in the formation of his style was his commission from Baron Schack to copy works of Titian, Rubens, Velazquez, and other masters for his gallery at Munich. In 1863 he was sent to Italy, and in 1867 to Spain. By the study of these masters he acquired his brilliant coloring. After his return to Munich in 1868 he devoted himself entirely to portraiture, which he had long recognized as his chief strength, and soon became the most famous portraitist of Germany. From 1872 to 1874 he resided in Vienna, where he was held in highest esteem, and painted the Emperor and other Austrian notables. In 1875-76 he visited Egypt, and after that time resided at Munich. Many of his winters, after 1882, were passed at Rome, where he was the centre of a brilliant artistic circle, and portrayed the Pope, Queen Margherita, and Minister Minghetti (1885, Dresden). He received gold medals at Paris (1875), Munich (1869, 1879), and Vienna (1882), and many orders, and honors, and an honorary doctorate was conferred on him by the University of Halle.

Lenbach's work in the beginning was as frankly realistic as that of Courbet, but his realism was softened and idealized by study of the old masters. His first portraits resemble Rembrandt's in the treatment of life and in characterization. He was a great admirer of Rubens, but neither Rubens nor Velazquez seems to have influenced him as much as Titian. The old masters, however, never affected the individuality of his work. He excelled especially in characterization. Knowing thoroughly his sitter, he portrayed him in the flitting moment which showed to the fullest extent the painter's conception of his character. His conception, though a high one, was always true. His color was harmonious and pleasing; he was a fine brushman, and knew just what to emphasize. Only the head and eyes were finished; the hands and dress much less so; and there were no accessories. At first famous for male portraits, in later life he succeeded also with women. Children he painted only after the birth of his own little girl, whom he portrayed many times and with great charm.

His best-known portraits are probably his numerous representations of Bismarck. The best examples of these portraits are in the National Gallery of Berlin, the New Pinakothek at Munich, and in the galleries of Hamburg and Leipzig, and elsewhere. His portraits of the Emperor William I. are also numerous. Among his other sitters were Count von Moltke, the Emperor Frederick III. as Crown Prince, Pope Leo XIII. (1885, New Pinakothek, Munich), Count Schack, Gladstone, Döllinger, Bishop Strossmayer, Delbrück, Richard Wagner, Franz Liszt, Helmholtz, Paul Heyse, Johann Strauss, Hans von Bülow, and Hermann Levi. His latest works include portraits of Mrs. Marion Crawford, Prince Regent Luitpold of Bavaria, the Imperial Chancellor Hohenlohe-Schillingsfürst, the historian Mommsen, and the architect Gabriel Seidel. The best known of his portraits of himself are those of 1865, in the Schack gallery at Munich, in the manner of Rembrandt, and that of 1895, in which the artist rivals Titian himself. Consult: Wyl, "Franz von Lenbachs Erzählungen aus seinem Leben," in *Deutsche Revue*, 1897, composed chiefly of conversations with Lenbach; Rosenberg, "Lenbach," in *Künstler Monographien* (Bielefeld, 1898). His portraits have been produced in heliogravure under the title, *Franz von Lenbachs zeitgenössische Bildnisse* (Munich, 1891-96).

LEN'CAN. An interesting tribe or confederacy, with several sub-tribes, constituting a distinct linguistic stock, occupying the mountain regions of Honduras, westward from Comayagua and perhaps extending over the Salvador border. They are fairly civilized, industrious and peaceable, although brave fighters with a strong feeling of native patriotism.

L'ENCLOS, läɴ'klō', NINON DE. See NINON DE LENCLOS.

LEND A HAND CLUBS. Societies of a religious, philanthropical, and social character formed among young people. The name is from a story by the Rev. Edward Everett Hale, *Ten Times One Is Ten* (Boston, 1870), relating how ten persons banded themselves together to live the mottoes, "Look up and not down; look forward and not backward; look out and not in; lend a hand." Each of the original ten persuaded ten others to devote themselves to the same service, and thus, according to the story, in twenty-seven years the entire world was won. The first Lend a Hand Club was formed in 1870, and without any concerted effort similar bands sprang up in many places. In 1874 a common bond was thought desirable, and at Chautauqua, N. Y., the "Look Up Legion" was formed; a little later its organ, *Lend a Hand*—a monthly, edited by Dr. Hale—was established. In 1891 the Ten Times One Corporation was brought into being. In 1900 there existed these affiliated societies: "The Look Up Legion;" "The Commercial Temperance Union;" "The Order of Send Me;" "The Lend a Hand Clubs;" "The I. H. N. [In His Name—the title of Mr. Hale's touching Waldensian story] Clubs." A badge, the Maltese cross, and a motto, "In His Name," have been adopted in common, but their use is voluntary. Consult Bacon and Northrop, *Young People's Societies* (New York, 1900). See CHRISTIAN ENDEAVOR, YOUNG PEOPLE'S SOCIETY OF; KING'S DAUGHTERS AND SONS; BROTHERHOOD OF SAINT ANDREW; EPWORTH LEAGUE.

LENEPVEU, lȧ'nȧ'vẽ', CHARLES FERDINAND (1840—). A French composer, born at Rouen. He was educated for the law, but determined to devote himself to the profession of music. He became a pupil of Savard, Ambroise Thomas, and Chauvet. In 1865 he won the Prix de Rome; in 1881 was appointed professor of harmony at the Conservatory, and in 1893 professor of composition. He has been a very successful composer, and his operas have been among the most popular of modern French compositions. In 1869 he won the prize offered by the Minister of Fine Arts, with a comic opera, a four-act grand opera was produced in London in 1882, and next in importance followed *Jeanne d'Arc*, a sacred drama in three parts, produced at the Rouen Cathedral in 1886. Other compositions include a *Requiem Mass*, smaller church numbers, melodies, scènes, lyriques, and small works for soli, choruses, and orchestra, of which one of the most successful examples is *Méditation*.

LENEPVEU, JULES EUGÈNE (1819-98). A French painter, born at Angers. He was a pupil of Picot and of the École des Beaux-Arts, exhibited "Idylle" at the Salon of 1843, won the Prix de Rome in 1847 with his "Mort de Vitellius," and in the same year exhibited a "Saint Saturnin." In 1855 he sent to the international exposition several canvases with some slight trace of Italian influence: "Les martyrs aux catacombes," "Pie IX. à la chapelle Sixtine," and "La Fête Dieu à Venise." More original were "Noce vénitienne" (1857), "Bénédiction de la chapelle Sainte Marie à Angers" (1859), "La Vierge au Calvaire" (1861), and "Hylas" (1865). In the later period of his life he exhibited less at the Salon and spent more time on the decoration of public buildings. This work includes the frescoes of the theatre at Angers; those of the "Glorification de la Vierge," "La purification," "Le portement du croix," and "La passion," in the chapel of the hospice of Saint Mary at Angers; and decorations of many Paris churches, especially Sainte Clotilde, Saint Louis en l'Ile, and Saint Sulpice.

L'ENFANT, lăn′făn′, Pierre Charles (1755-1825). A French officer, who came to America with Lafayette in 1777, and joined the American army. He was promoted to a captaincy in the engineers in 1779; was severely wounded in the attack on Savannah in the same year; was taken prisoner at Charleston in May, 1780; was exchanged in the following November; and was commissioned brevet major, May 2, 1783. He designed the badge of the Order of the Cincinnati. He was intrusted with the work of laying out the city of Washington, but was removed before all his plans were carried out. In 1812 he declined the professorship of engineering at West Point.

LENNÉ, lĕn-nā′, Peter Joseph (1789-1866). A noted German landscape gardener and architect, son of the famous naturalist best known by the Latinized name Linnæus. (See Linnæus.) After studying the sciences and architecture he went to Paris and Vienna to specialize in garden architecture and arrangement. At Vienna he remodeled the gardens of the Court, and at Berlin he united beautifully the gardens and parks of Potsdam. He was the architect of the prison at Coblenz, the school of architecture and horticulture at Berlin, and the restorer of the residence of Sans-Souci. His fame was so well deserved that his torso was placed in the galleries of Sans-Souci.

LENNEP, lĕn′nĕp, Jacob van (1802-68). A Dutch dramatist and novelist, born in Amsterdam, son of the philologist David Jacob Lennep. Educated for the law, he soon acquired a large practice, writing at the same time poems (1826-27) and many patriotic novels and plays that won him the title of the Walter Scott of Holland. Of these the first were versified *Legends of the Fatherland* (1828), followed by the comedies *The Frontier Village* (1830) and *The Village Over the Frontier* (1830), and the novels (among many others) *Our Forefathers* (1838), *The Rose of Dekama*, and *The Adopted Son*, the last two translated (1847). Lennep also made noteworthy translations into Dutch from Shakespeare, Byron, Southey, and Tennyson, and worked for some years on an uncompleted edition of the great Dutch poet Vondel. Lennep's *Dramatic Works* are collected in 3 vols. (1852-54), his poems in 13 vols. (1859-72), his novels in 23 (1855-72). His *De Voornaamste Geschiedenissen van Noord-Nederland*, corresponding to Scott's *Tales of a Grandfather*, are in four volumes (1845-49). Lennep was also a diligent contributor to periodicals. Consult his *Life* and a bibliography in Ten Brink, *Geschiedenis der Noord-Nederlandsche Letteren in de XIX. eeuw*, vol. i. (Amsterdam, 1888).

LENNGREN, lĕn′grĕn, Anna Maria (1755-1819). A Swedish poet, born probably at Upsala. Her father, Magnus Malmstedt, was a professor at the University of Upsala, and Anna was carefully educated. When she was eighteen her first poem appeared and attracted much attention. Afterwards she translated French and Latin plays, which were presented before the Court. In 1870 she married Karl Peter Lenngren, one of the editors of the *Stockholmsposten*, and her poems were published anonymously in this journal for several years. When her identity was discovered, the Swedes hailed their new poet with enthusiasm. She is not profound or imaginative in an original way, but she is always graceful and natural, and her idylls and satires reflect the life she knew. Her collected poems (*Skaldeförsök*) were first published in 1819, in 1856 with a biography by Carlén, and again with a biography by Warburg, and illustrations by Larsson (Stockholm, 1884 and 1890, 11th and 12th editions).

LENNI LENAPE, lĕn′nē le-nä′pā. An Algonquin tribe. See Delaware.

LEN′NOX, Charlotte Ramsay (1720-1804). An Anglo-American poet, Shakespearean critic, and miscellaneous writer, born in New York. Her father was Lieutenant-Governor Ramsay. She was sent to school in England at fifteen; married there; never returned to America; and at the age of twenty-seven attracted attention by a volume of *Poems on Several Occasions* (1747). She was highly esteemed by the novelist Richardson and by Samuel Johnson, and on the death of her husband, Henry Lennox, supported herself by miscellaneous writing. Among her works were: *Memoirs of Harriet Stuart* (1751), *The Female Quixote* (1752), and *Henrietta* (1758), popular novels; a translation of *Sully's Memoirs* (1761, reprinted 1854-56); a novel, *Sophia;* two comedies, *The Sisters* (1769), *Old City Manners* (1773); *Euphemia*, a novel (1790); and *Memoirs of Henry Lennox* (1804). Most noteworthy of her works is *Shakespeare Illustrated* (3 vols., 1753-54), a collection of the novelistic sources of Shakespeare, translated and annotated with the general aim of showing the inferiority of the dramas to their originals. Dr. Johnson was thought to have had a hand in this work, for which he wrote the dedication. For an amusing sketch of the work, consult Lounsbury, *Shakespeare as a Dramatist* (New York, 1901).

LENNOX, William Pitt, Lord (1799-1881). An English soldier and writer, fourth son of the fourth Duke of Richmond, and godson of William Pitt. He was educated at Westminster, and, having entered the army, served for several years on the staff of the Duke of Wellington. He was also a voluminous contributor to the *Sporting Review*, *Bentley's*, and other magazines and newspapers. Among his publications, which include works on history and fiction, are: *Compton Audley* (1841); *The Tuft-Hunter* (1843); *Percy Hamilton* (1852); *Philip Courtney* (1852); *Merrie England* (1857); *Recreations of a Sportsman* (1862); *Adventures of a Man of Family* (1864); *Drafts on My Memory* (1865); *Fifty Years' Biographical Reminiscences* (1863); *My Recollections from 1806 to 1873* (1873); *Life of the Fifth Duke of Richmond* (1862).

LENNOX, Earl of. See Stewart.

LENOIR, le-nwär′, Alexandre Albert (1801-91). A French architect, son of Alexandre Marie Lenoir, the painter and archæologist. He studied at the Collège Bourbon, and was a pupil of Debret in the Ecole des Beaux-Arts. He lived in Rome (1830-32), and in 1833 wrote *Projet d'un musée historique*, suggesting the union of the Palais des Thermes and the Hôtel de Cluny. He was appointed architect to carry out this plan; became a member of the committee on historic monuments in the Bureau of Education, secretary of the Ecole des Beaux-Arts for life (1862), and a member of the Academy of Fine Arts (1869). He wrote the very valuable work, *In-*

struction sur l'architecture monastique (1852-56); *Des monuments antérieurs à l'établissement du christianisme dans les Gaules* (1840); *Architecture militaire au moyen âge*, and *Monuments religieux au moyen âge* (1847); *Le tombeau de Napoléon Ier aux Invalides* (1855); and *Statistique monumentale de Paris* (1861-67). He was famous for his reproductions of mediæval buildings.

LENORE′, *Ger. pron.* lâ-nō′re. (1) A noted ballad by Bürger (1773) and the name of its heroine. The story rests on a variety of similar Slavic tales, which gave rise to the German tradition. Its basis is the popular belief that the tears of a maiden for a lost lover may bring him back from the grave in the form of a vampire. In all the tales of this class the lover fetches the maiden from her home and carries her with him on a demoniac ride to the churchyard, where she is either torn in pieces or rescued at the last moment by the crowing of the cock or by some providential intervention. (2) A poem by E. A. Poe, first published under the title *A Pæan* (1831). (3) The heroine of Poe's *Raven*.

LENORMAND, le-nôr′mäɴ′, Marie Anne Adelaide (1772-1843). A French fortune-teller, born at Alençon. After going to Paris (1790) she took up fortune-telling as a profession. She soon attracted attention, and opened a 'cabinet of divining,' where for many years she was consulted by persons of all ranks, even by the Court of Napoleon. It is said that Josephine was greatly influenced by her. In 1809 she had to leave Paris, and went to Brussels. She was repeatedly imprisoned. Among her publications are: *Prophétiques* (1815); *Mémoires historiques et secrets de l'impératrice Joséphine* (1820); and *Souvenirs de la Belgique* (1822).

LENORMANT, le-nôr′mäɴ′, Charles (1802-59). A French archæologist, born in Paris. He originally studied law, but after visiting Italy devoted himself to archæology. He was made inspector of fine arts in 1825, and in 1828 accompanied the younger Champollion to Egypt. Afterwards he went to Greece as a member of the commission to explore the Morea. He was made curator of the library of the Arsenal in 1830; curator of printed books in the Royal Library in 1837, and director of the cabinet of medals in 1841. Meanwhile he had lectured at the Sorbonne. He was elected to the Institute in 1839, and in 1848 was appointed to the chair of Egyptian archæology in the College of France. He contributed numerous articles on art and archæology, chiefly to the *Correspondant* (edited by him, 1843-55), and wrote several works, including *Des artistes contemporains* (1833); *Questions historiques* (1845); *Introduction à l'histoire orientale* (1838); *Musée des antiquités égyptiennes* (1842); *Le trésor de numismatique et de glyptique* (1836-50), with Paul Delaroche and Henriquel-Dupont; and *Elite des monuments céramographiques* (1844-57) with de Witte.

LENORMANT, François (1837-83). A French archæologist, born in Paris, January 17, 1837. He was early trained by his father, the archæologist Charles Lenormant, in the Greek literature and instructed as to the monuments; and when only fourteen years of age, he published an article on some Greek tablets from Memphis in the *Revue Archéologique*. In 1857 he was awarded the numismatic prize by the *Académie des Inscriptions*, and two years later went with his father to Greece and the East. In 1860, after the massacre of Christians by the Druses, he went to Syria, and afterwards published a *Histoire des massacres de Syrie en 1860* (1861). Returning to Greece, he conducted excavations at Eleusis and along the Sacred Way, of which the results were partially embodied in *La voie sacrée éleusinienne* (1864), a work unfortunately never completed, and in articles in periodicals. In 1862 he was appointed sub-librarian of the French Institute, and in 1874 professor of archæology at the Bibliothèque Nationale. During his last years he devoted part of his time to an exploration of the less-visited parts of Southern Italy. Here he met with an accident, and after a long illness died, December 9, 1883. Lenormant was a scholar of encyclopædic learning, a wonderful diversity of interest, and great productivity. In Greek archæology proper, his contributions were largely in the form of articles in such journals as the *Revue Archéologique* and the *Gazette Archéologique*, of which he was founder (with De Witte), editor, and chief contributor. He edited, with Robiou, *Chefs d'œuvre de l'art antique* (7 vols., 1867-68), and had begun to publish the results of his Italian travels in *La Grande-Grèce* (1880-84), and *A travers l'Apulie et la Lucanie* (1883). In the field of numismatics his great work was *La monnaie dans l'antiquité* (1878-79), of which only three volumes appeared, but he also published a popular work, *Monnaies et médailles* (1883), and numerous essays. Perhaps his most lasting work was done in the study of the ancient nations of the East, with especial reference to the origins and early forms of their civilization. His studies were summarized in the *Manuel de l'histoire ancienne de l'Orient* (1869; 9th ed. 1881-83), and *Les origines de l'histoire d'après la bible et les traditions des peuples orientaux* (1880-84). His discovery of the Accadian, a non-Semitic language, in the cuneiform texts, was announced and defended in a series of papers, and his investigation of the Chaldean religion led to the publication of *Les sciences occultes en Asie* (1874-75). Important at the time of its publication was the *Essai sur la propagation de l'alphabet phénicien dans l'ancien monde* (1872-75).

LE NÔTRE, le nō′tr', André (1613-1700). A French landscape gardener, born in Paris. He was the son of the superintendent of the Tuileries gardens, and was sent to study painting under Simon Vouet. But Le Nôtre preferred the occupation of his father, and soon gained such a reputation that Fouquet gave him charge of laying out the grounds of the Château de Vaux. This was the first example of the formal French garden, stiffly designed on geometrical lines, with artificial lakes and grottoes, and ornamented with statues and clipped trees. But, despite its severity, the design had a certain grandeur, and it suited the architecture of the day. When Louis XIV. saw these gardens *en fête*, he made Le Nôtre director of the royal grounds, and gave him charge of the new park of Versailles, which shows, more than any other of his works, his wonderful knowledge of perspective. Other French gardens that he laid out, entirely or partially, are those of Chantilly, Meudon, Saint-Cloud, Fontainebleau, Saint-Germain-en-Laye, and Sceaux. He went to Italy in 1678, and was received by the Pope with great friendliness. In Rome he laid out the gardens of the Vatican, the Quirinal, the Villa Albani, the Villa Ludovisi, and the Villa Doria Pamphili. He also designed the park at Greenwich, and the Saint James and Kensington gardens in London.

LEN′OX. A town, widely known as a summer resort, including the villages of New Lenox and Lenoxdale, in Berkshire County, Mass., six miles south of Pittsfield; on the New York, New Haven and Hartford Railroad (Map: Massachusetts, A 3). Lenox itself is of great beauty, and the surrounding region presents many points of interest. Among the attractions are Mahkeenac and Laurel Lakes, Bald Head, the Ledge, Mattoon Hill, and Perry Peak, besides many fine residences and grounds. Nathaniel Hawthorne, Henry Ward Beecher, and Fanny Kemble were residents of Lenox. The government is administered by town meetings. Settled in 1750, Lenox was incorporated as a district in 1767, and named in honor of Charles Lenox, Duke of Richmond. Population, in 1890, 2889; in 1900, 2942.

LENOX, James (1800-80). An American philanthropist, born in New York City, where his father, a wealthy Scotch merchant, had settled in 1784. He studied at Columbia, was admitted to the bar, and for a time was connected with his father in business; but the great passion of his life was collecting books and objects of art. During the years that he was most actively engaged in this work his library grew so rapidly that it was impossible for him to arrange it systematically, and the books as they were received and checked off were stored in the vacant apartments of his residence. This, of course, rendered it exceedingly difficult to find particular volumes, and as he refused to allow others access to his storeroom, the library remained practically unused until it was removed to the building on Fifth Avenue which he erected for its reception in 1870. It is especially rich in Americana, and contains a very complete collection of Bibles, and many rare and beautifully bound volumes. Besides giving his library to the city of New York, Mr. Lenox contributed generously to the Presbyterian Hospital in that city, to Princeton University, and to many public and private charities.

LENS, läɴ. A town of France, in the Department of Pas-de-Calais, on the Souchez, 17 miles south-southwest of Lille. It is a place of great antiquity, and was once strongly fortified. It has iron and steel foundries and manufactures sugar, soap, etc. In the vicinity are highly productive coal-mines. It is famous for the victory gained by the Prince of Condé over Leopold William, Archduke of Austria, under its walls, in 1648. Population, in 1891, 13,862; in 1901, 24,370.

LENS (Neo-Lat., from Lat. *lens*, lentil; so called on account of the shape of the lens). A circular section of a transparent substance, having its surfaces either both spherical, or one of them plane and the other spherical. Lenses are either convex (thickest in the middle) or concave (thickest at the edges), and a ray of light in passing through a lens is bent toward its thickest part. The former class changes the direction of the rays by making them more convergent than before; the latter makes them more divergent. The point to which the rays converge, or from which they diverge, is called a *focus*—*principal focus* when the rays are parallel. The focus for a convex lens is real, i.e. the rays actually pass through it, form a real and inverted image smaller or larger than the object, according as the object is at a distance greater or less than twice the focal length; but if the object be within the principal focal length a virtual image is formed, erect and magnified. For a concave lens the focus is virtual—the rays seem to come from it and form an erect image smaller than the object. See Light, where a section is devoted to lenses and the various theoretical questions involved are discussed. For different forms of lenses as used in various optical instruments, see Microscope; Photography; Telescope, etc. See, also, Aberration, Spherical; and Aberration, Chromatic. Consult: Preston, *Theory of Light* (New York, 1895); Glazebrook, *Physical Optics* (London and New York, 1898).

LENSTRÖM, lĕn′strēm, Carl Julius (1811-93). A Swedish poet and critic, born at Gefle. He studied philosophy and theology at Upsala, took orders in 1834, and taught literature at the University of Upsala from 1836 to 1843. During the next two years he taught philosophy at Gefle. In 1845 he was appointed rector at Vester-Loefsta. He wrote on philosophy, poetry, theology, and æsthetics, and his principal publications include a compendium of the Church history of his country, *Lärobok i allmänna och svenska Kyrkohistorian* (1842); contributions to the history of Swedish æsthetics, *Bidrag till den svenska ästhetikens historia* (1840); *Fahlujuvelen* (1838), a novel; *Cromwell* (1860), a poem; *Gustaf II. Adolf* (1860), poems, and some sketches, *De fyra stånden, taflor ur svenskt sedelif* (1865).

LENT (AS. *lencten*, *lengten*, OHG. *lenzin*, *lengizin*, *lenzo*, Ger. *Lenz*, spring, from AS. *long*, OHG., Ger. *lang*, Lat. *longus*; so called from the lengthening days in spring). The season of fasting observed before Easter in the Roman Catholic, Eastern, and Anglican churches. Its length has varied considerably in different times and places. Before the third century there is positive evidence of the solemn observance everywhere of the last two days of Holy Week, and it gradually spread to include the whole week. But outside of this solemn fast, Tertullian, Origen, and other early writers allude to a forty days' fast, and the Council of Nicæa (325) recognizes it as an established custom. The probability is that it was a practice of the more zealous even in Apostolic times, and gradually grew into a rule. The period of forty days was adopted in commemoration of the fasting of Christ, as well as Moses and Elijah, for that length of time. See Easter; Fast; Holy Week.

LENT′HALL, William (1591-1662). An English politician. He was born at Henley-on-Thames, studied at Oxford, and was called to the bar in 1616. He represented Woodstock in the Short Parliament of 1640 and in the Long Parliament, serving as Speaker from 1640 to 1653. When Cromwell as Protector summoned his first Parliament, Lenthall was again chosen to the chair (1654), and was a member of the Parliament of 1656 also. On the reassembling in 1659 of the Long Parliament, he resumed his former position, and, convinced of the inevitability of the Restoration, subsequently aided in bringing it about. His career, admittedly successful as Speaker, was attacked by contemporaries on the ground of loyalty; on the other hand, his refusal to indicate whether or not the five accused members in the House of Commons were present when in 1642 the King attempted to arrest them, was appreciated by Parliament and made him famous.

LENTICELS (Fr. *lenticelle*, diminutive of *lenticule*, lens-shaped, lentil-shaped, from Lat. *lenticula*, lentil, diminutive of *lens*, lentil). Roundish or elongated corky patches of various sizes, usually projecting a little above the epidermis of stems. Where cork-formation ('bark') is going on, at certain points corresponding usually to the stomata ('breathing-pores') of the epidermis, the cork-cells become rounded and loosened from one another. Under the strain the epidermis ruptures, and the powdery mass of cells is exposed, through a usually biconvex rift, whose shape suggested for the structure the name 'lenticel.' Lenticels are present in all the great groups of vascular plants, and very few plants with a regular annual formation of cork fail to show them. They are most conspicuous on young shoots, but in some cases, as in the birch, they become more prominent as they grow older. The lenticels that are developed at a point early determined by a stoma, a root, or a bud, are called primary lenticels; while those which are formed later, and at a point not determined by an organ, are called secondary. Lenticels serve to admit air to the living internal tissues, through an impervious corky layer, and they vary in porosity in different plants and at different seasons.

LENTIL (OF. *lentille*, from Lat. *lenticula*, diminutive of *lens*, lentil), *Vicia hirsuta* or *Lens hirsuta*. An annual leguminous plant, related to tares (see TARE), a native of the Mediterranean region. It is extensively cultivated in the south of Europe, in Egypt, in the East, and to some extent in other parts of the world. It has a weak, branching stem, from 6 to 18 inches high, and pinnate leaves with 6 to 8 pairs of leaflets and terminal tendrils. The flowers are small, white, lilac, or pale blue. The pods are very short and blunt, thin and smooth, and contain two seeds shaped like a double convex lens. There are numerous varieties, with white, brown, and black seeds, of various sizes, the largest being about one-half inch in diameter. The lentil grows best in a light and rather dry soil; in a very rich soil it produces comparatively few pods.

LENTIL.

Unlike the pea and the bean, the lentil is eaten only when fully ripe. The brown or reddish lentil is smaller than the yellow, but of more delicate flavor. It is one of the most ancient of food-plants—probably one of the first to be brought under cultivation by man. Since it has been grown from early times in Asia and in the Mediterranean countries, it seems probable that the reddish Egyptian lentil was the 'red pottage' of Esau. In Europe this legume is far less grown than the pea and the bean, partly because its yield of seed and straw is less. The market is partially supplied from Egypt. The lentil, according to analysis, is one of the most nutritious of all the legumes, but its flavor is pronounced and to some persons not as agreeable as that of the pea and the bean. Its seeds have the following percentage composition: Water, 8.4; protein, 25.7; fat, 1.0; carbohydrates, 59.2; and ash, 5.7, the fuel value being 1620 calories a pound. Like all legumes used as food, they are especially rich in protein. It is generally used for soup or purée. In the Mediterranean countries it is often eaten roasted. It has been little known in the United States, but with the growth of the foreign population its use has steadily increased. The lentils found in our markets are all imported, but the culture of this legume from European seeds is being tried in the Southwestern Territories and elsewhere. A small variety of lentil is already grown in New Mexico and Arizona, as well as in Mexico, the seed of which was doubtless brought from Spain centuries ago by the ancestors of the present mixed race living there.

LENTINI, lĕn-tē′nê (Lat. *Leontini*). A city in the Province of Syracuse, Sicily, 18 miles by rail south of Catania (Map: Italy, K 10). The centre of the city is three miles from the railway station. To the north lies Lake Lentini, from 9 to 12 miles in circumference, according to the height of the water. It did not exist in ancient times, and its vapors make the city unhealthful in summer. Lentini is a market for rice and other grain, oil, wine, flax, cattle, and for water-fowl and fish from the lake. The ancient Leontini was founded in B.C. 729 by colonists from Naxos, and was the birthplace of Gorgias, the sophist and orator, who persuaded Athens to intervene in Sicily. Population (commune), in 1881, 13,462; in 1901, 17,134.

LENTINO, lĕn-tē′nô, JACOPO DA, usually called IL NOTAJO DA LENTINO (the Notary of Lentino). One of the earliest of Italian poets, who lived during the first half of the thirteenth century. He is presumed to have studied at Bologna, and lived in Tuscany for at least a part of his life. He is spoken of by Dante in doubtful terms (*Purgatory*, cxxiv.) for the carelessness of his language, but some of his poems, translated by Rossetti in *Dante and His Circle*, have much charm. His sonnets and canzoni are in the usual manner of the Sicilian school. Consult Gaspary, *Die sicilianische Dichterschule des dreizehnten Jahrhunderts* (Berlin, 1878).

LENTO, lĕn′tô (It., slow). In music, a term indicating a tempo between grave (q.v.) and adagio (q.v.).

LEN'TULUS. A well-known cognomen of the Cornelia family in ancient Rome. The best-known members of this branch of the famous patrician gens were the following: (1) P. CORNELIUS LENTULUS SURA, quæstor under Sulla in B.C. 81, prætor in 75, and consul in 71. In B.C. 70, along with many others, he was expelled from the senatorial order by the censors, for his vices, and remained under a cloud of disgrace. He became prætor again in B.C. 63, the year of Cicero's consulship, when he joined in Catiline's conspiracy, and was the leader of the conspirators within the walls when Catiline left to take the lead in the field. Cicero, however, obtained full proofs of the conspiracy from the ambassadors of the Allobroges; and when Lentulus and his comrades were confronted with the evidence, they were forced to confess their guilt. Lentulus himself resigned his office, and was put to death with the other leaders in the *Tullianum*. (2) P. CORNELIUS LENTULUS SPINTHER, a friend of Cicero, only a very distant relative of the above. He was curule ædile in B.C. 63 (the year of Cicero's consulship), when the conspirator Lentulus was given into his custody after his arrest. He was prætor in B.C. 60, and consul in 57, when he procured Cicero's recall from exile. In the following years he followed the fortunes of Pompey, but Cæsar pardoned him, and we hear nothing of the end of his life. (3) Son of the last, of the same name, also a follower of Pompey. Pardoned by Cæsar, he finally joined Brutus and Cassius in their campaigns, and coined silver money for the payment of their troops, specimens of which are common.

LENZ, lĕnts, JAKOB MICHAEL REINHOLD (1751-92). A German poet and dramatist, born at Sesswegen, Livonia. After studying at Königsberg, he went to Strassburg in 1771 as tutor to two young noblemen from Courland. At Strassburg he allied himself to the literary coterie of which Goethe was a member. In 1776 he followed Goethe to Weimar, where, despite his friends' remonstrances, he showed such utter disregard for social conventions that he was continually in trouble. Finally, he was banished from Weimar, wandered in various countries, became insane, and died an object of charity in Moscow. Lenz was one of the most typical examples of the poets of the "Storm and Stress" period. In his works he railed against the blind servitude to French Classicism; in his life he proclaimed the right of nature against conventionality. He was a gifted but wayward writer. He has been ranked next to Goethe—"*longo sed proximus intervallo*," however, as Erich Schmidt has written—among the dramatists of the Storm and Stress. His *Der Hofmeister* was by many of his contemporaries attributed to Goethe. His shorter poems often contain passages of exquisite lyric beauty. Consult: Tieck, *Gesammelte Schriften von Lenz* (1819); Schmidt, *Lenz und Klinger* (1878); Froitzheim, *Lenz und Goethe.*

LENZ, MAX (1850—). A German historian. He was born at Greifswald, and studied at Bonn, Greifswald, and Berlin. In 1881 he was made professor of mediæval and modern history at Marburg; seven years later went to Breslau, and in 1890 to the University of Berlin. He wrote on the period of the Reformation: ***Briefwechsel Landgraf Philipps des Grossmütigen von Hessen mit Bucer*** (1880-91); ***Drei Traktate aus dem Schriftencyklus des Konstanzer Konzils*** (1876); ***Martin Luther*** (1883).

LENZ, OSKAR (1848—). A German geographer and explorer, born in Leipzig and educated in the university there (1866-70). As a member of the Austrian Geological Institute he went on geological expeditions in Croatia, Hungary, and Bohemia. and assisted Hochstetter in preparing *Die zweite deutsche Nordpolfahrt* (1874). In 1874 he went on a scientific expedition for the German African Company and spent three years in West Africa. On a second journey, in 1880, he crossed the western Sahara in the disguise of an Arab merchant, reaching Timbuktu. In 1886 he undertook an expedition for the relief of Junker, Casati, and Lupton, who were penned up by the Mahdi revolt. On this journey he made valuable discoveries in East Africa, especially around the sources of the Nile. He returned to Austria in 1887 and became professor of geography in the German University of Prague. His African tours are described in: ***Skizzen aus Westafrika*** (1878); ***Timbuktu. Reise durch Marokko, die Sahara und den Sudân***, which contains many valuable contributions to our knowledge of the Sahara; and ***Wanderungen in Afrika*** (1895). His later works are: ***Die sogenannten Zwergvölker Afrikas*** (1894); ***Ueber Geld bei Naturvölkern*** (1895); ***Ophir und die Ruinen bei Simbaby*** (1896); and "Geographie von Afrika," in Andree, ***Handbuch der Geographie*** (1899).

LE'O (Lat., lion). The fifth sign of the zodiac (q.v.).

LEO. The name of thirteen popes. LEO I., Saint, Pope 440-461, surnamed 'the Great,' one of the most eminent of the Latin fathers. He was born in Tuscany. By Pope Celestine I. (422-432) he was made one of the seven Roman deacons. His influence is attested by Cassian's dedication to him of his *De Incarnatione Contra Nestorium* (430), and Cyril of Alexandria appealed to his aid against Bishop Juvenal of Jerusalem, who desired to be made a patriarch (431). Pope Sixtus III. (432-444) sent him on a civil embassy to Gaul, while absent on which he was elected Pope. Leo's letters, addressed to all parts of the Church, exhibit prodigious activity and zeal, and are used by Catholic controversialists as an evidence of the extent of the jurisdiction of the Roman See. In a council held at Rome in 449, he set aside the proceedings of the so-called Robber Synod of Ephesus, which had been held that year and had pronounced in favor of Eutyches (q.v.), summoned a new council at Chalcedon, in which his legates presided, and in which Leo's celebrated 'dogmatical letter' was accepted 'as the voice of Peter,' and adopted as the authentic exposition of the orthodox doctrine on the person of Christ. The history of Leo's interposition with Attila (452) in defense of the Roman city and people will be found in the article ATTILA; and his subsequent similar interposition with Genseric (455), if less dramatic in the incidents with which history or legend has invested it, was at least so far successful as to save the lives of the citizens, and the public and private buildings of the city of Rome. He formulated clearly the monarchical idea of the Papacy, which he conceived to be built upon Peter and the divinely constituted head of the Christian world. Accordingly he acted consistently in the character of universal bishop. He regulated affairs in Africa no less than in Gaul and Spain. When he found that the Council of Chalcedon (451) had put Constantinople above all other apostolic patriarchates, he required the Emperor to cancel the offensive 28th canon, and as the Emperor declared that its confirmation depended upon the Pope, Leo asserted that the

Greeks had given it up. Leo endeavored to extirpate heresy (Manicheism, Priscillianism), but rather unsuccessfully. He died in Rome, November 10, 461. His sermons and letters, of great interest and value, are in Migne, *Patrologia Latina*, liv.-lvi., and a partial English translation in *Nicene and Post-Nicene Fathers*, 2d series, xii. Consult: Gore, *Leo the Great* (London, 1880); Arendt, *Leo der Grosse und seine Zeit* (Mainz, 1835); Perthel, *Papst Leos I. Leben und Lehren* (Jena, 1843); Langen, *Geschichte der römischen Kirche von Leo I. bis Nicolaus I.* (Bonn, 1885).

Leo II., Saint, Pope 682-683. He was born in Sicily. He confirmed the canons of the Council of Constantinople (680-681), and the condemnation of Pope Honorius for "not extinguishing the flame of incipient heresy." He succeeded in healing the schism between the sees of Rome and Ravenna, through an arrangement by which the bishops of Ravenna were to be ordained at Rome and to be excused from the payment of the money fee previously exacted from them. He was the friend and patron of church music, and aided in the improvement of the Gregorian chant. His letters are in Migne, *Patrologia Latina*, xcvi.

Leo III., Pope 795-816. His pontificate is chiefly remarkable as the epoch of the establishment of the new Empire of the West. He was a native of Rome. During the greater part of the eighth century the popes, through the practical withdrawal of the Byzantine emperors, had exercised a temporal supremacy in Rome, which was fully recognized by the gift of Pepin, the pontiffs being placed under the protectorate of the Frankish sovereigns, who received the title of patrician. The pontificate of Leo, however, was a troubled one, and in 799 he was treated with much violence and obliged to flee to Spoleto, whence he afterwards repaired to Paderborn, in order to hold a conference with Charlemagne. On his return to Rome he was received with much honor by the Romans, and the chiefs of the conspiracy against him were sentenced to banishment. In the following year (800) Charlemagne, having come to Rome, was solemnly crowned and saluted Roman Emperor by the Pope, and the temporal sovereignty of the Pope over the Roman city and State, though under the suzerainty of the Emperor, was formally established. In 804 Leo visited Charlemagne at his court at Aix-la-Chapelle. With Charlemagne's successor, Louis le Débonnaire, Leo was embroiled in a dispute about the right of sovereign jurisdiction in Rome, which had not been brought to a conclusion when Leo died in Rome, May 25, 816. Consult his letters in Migne, *Patrologia Latina*, cii.

Leo IV., Saint, Pope 847-855. He was a native of Rome. He built a new Roman suburb, occupying four years in the task, and it was named in his honor *Civitas Leonina*. He also restored Porta, a town near the mouth of the Tiber, where he colonized several thousand Corsicans who had been driven from their own country by an inroad of Saracens. He also founded a new town which was called Leopolis, since destroyed. Consult his works in Migne, *Patrologia Latina*, cxv.

Leo V., Pope 903. **Leo VI.**, Pope 928-929. **Leo VII.**, Pope 936-939. All these three held office in the darkest times of the Papacy, when it was under the domination of turbulent and ambitious secular lords and women. Leo VII. is said to have been a man of great personal holiness and austerity, and to have done much to restore monastic discipline. His letters are in Migne, *Patrologia Latina*, cxxxii.—**Leo VIII.**, Pope 963-965. These dates, however, must be taken with the qualification that his title to the Papacy was not good until after the abdication in June, 964, of Benedict V., the legitimate successor of John XII., in whose place Leo was put by the Emperor Otho I.—**Leo IX.**, Saint, Pope 1048-54. Bruno, son of Count Hugh of Egisheim, a cousin of the Emperor Conrad II. He was born in 1002 at Egisheim in Alsace, and became a canon and then Bishop of Toul. He was instrumental in the negotiation of four treaties between the emperors and the kings of France, and was elected Pope by the influence of Henry III. He was a man of great erudition, and did much to correct abuses. His steadfast assertion of the prerogatives of his office was a preparation for the conflict waged by Henry VII. against the Empire. He supported the Greek Emperor in Southern Italy against the Normans, by whom he was captured and detained, though with every mark of respect, for nine months. Restored to Rome on becoming dangerously ill, he died in 1054, recognized already, by popular consent, as a saint. His day is April 19th. Consult Hunkler, *Leo der Neunte und seine Zeit* (Mainz, 1851).

Leo X., Pope 1513-21. Giovanni de' Medici, the son of Lorenzo the Magnificent. He was born in Florence in 1475, and destined in childhood for an ecclesiastical career. His education was intrusted to the ablest scholars of the age; and through the influence of his father with Pope Innocent VIII., he was created a cardinal at the age of thirteen years, in 1488. In the expulsion of the Medici from Florence, in 1494, the young cardinal was included, and he used the occasion as an opportunity of foreign travel. He was employed as legate by Julius II.; and during the war with the French he was taken prisoner in the battle of Ravenna, but soon afterwards effected his escape. On the death of Julius II., in 1513, he was chosen Pope at the early age of thirty-seven, and took the name of Leo X. His first appointment of the two great scholars Bembo and Sadoleto as his secretaries was a pledge of the favor toward learning which was the characteristic of his pontificate; but he did not neglect the more material interests of the Church and the Roman See. He brought to a successful conclusion the Fifth Council of the Lateran, and averted the schism which was threatened by the rival Council of Pisa. At the beginning of his reign his forces aided in driving the French from Italy, although in 1515 the new King, Francis I., restored the fortunes of France. In 1516 Leo concluded a concordat with Francis, which continued to regulate the French Church till the Revolution. In the political relations of the Roman See he consolidated, and in some degree extended, the reconquests of his warlike predecessor, Julius II., although he used his position and his influence for the aggrandizement of his family. His desertion of the alliance of Francis I. for that of his young rival, Charles V., although the subject of much criticism, was dictated by a sound consideration of the interests of Italy. But it is most of all as a patron of learning and art that the reputation of Leo has lived with posterity. Himself a scholar, he loved learning for its own sake; and his Court was the meeting-point of all the scholars of Italy and the world. He founded a

Greek college in Rome, and established a Greek press, which he endowed munificently. (See Lascaris.) In the encouragement of art he was no less munificent. Painting, sculpture, architecture, were equally favored; and it is to his vast project for the rebuilding of Saint Peter's, and to the step to which he had recourse for procuring the necessary funds—his permitting the preaching of an indulgence, one of the conditions of obtaining which was the contribution to this work—that the first rise of the Reformation in Germany is ascribed. He himself seems to have regarded the movement as of little importance, describing it as 'a squabble among the friars.' In 1520 he issued a bull of excommunication against Luther, which the Reformer burned. Leo X.'s personal habits were in keeping with his taste, splendid and munificent in the highest degree. In his moral conduct he maintained a strict propriety, although he was not free from the stain of nepotism, the vice of that age, and his character was more modeled on the ideal of an enlightened prince than on that of a zealous and ascetic churchman. His death, which occurred rather suddenly on December 1, 1521, during the public rejoicings in Rome for the taking of Milan, was by some ascribed to poison; but there seems no solid reason for the suspicion. Consult: Roscoe, *Life and Pontificate of Leo X.* (Liverpool, 1805; new ed. London, 1883); Conforti, *Leone X. ed il suo secolo* (Parma, 1896); Niti, *Leone X. e la sua politica* (Florence, 1892); and his *Regesta*, ed. Cardinal Hergenröther (Freiburg, 1884-91).

Leo XI., Pope 1605. Alessandro Ottaviano de' Medici. He was born in Florence in 1535 and made Bishop of Pistoia in 1573, Archbishop of Florence and cardinal in 1574, holding later the cardinal-bishoprics of Albano and Palestrina. Clement VIII. intrusted him in 1596 with the difficult mission to the Court of France, soon after the conversion of Henry IV., and he acted for the Holy See in the conclusion of the Peace of Vervins. He became Pope on April 1, 1605, but reigned only twenty-six days.

Leo XII., Pope 1823-29. Annibale della Genga. He was born near Spoleto in 1760, and educated in Rome for the priesthood, which he received in 1783. After serving as chamberlain and secretary to Pius VI. he was made titular Archbishop of Tyre in 1793 and appointed Nuncio at Cologne, though the fortunes of war obliged him to change his residence several times. Under Pius VII. he was employed on diplomatic missions in Germany, and after Napoleon's fall was the bearer of the Pope's congratulations to Louis XVIII. He was made a cardinal in 1816, and held the Bishopric of Sinigaglia until 1820, when he returned to Rome as Cardinal-Vicar. In 1823 he was elected to succeed Pope Pius VII. His pontificate was marked by great zeal for the welfare of the Church, both in Europe and abroad. At home he condemned the secret societies, especially the Free Masons and the Carbonari. Consult: Wiseman, *Recollections of the Last Four Popes* (London, 1858); Artand de Montor, *Histoire du pape Léon XII.* (2 vols., Paris, 1843).

Leo XIII., Pope 1878-1903. Gioacchino Vincenzo Raffaello Luigi Pecci. He was born in the ancestral seat of his family at Carpineto, 37 miles from Rome, March 2, 1810, and educated in the Jesuit college at Viterbo and the Collegio Romano, making further studies in law and theology after taking his doctor's degree from the latter. He was ordained priest and made a domestic prelate by Gregory XVI. in 1837. As delegate successively at Benevento, Spoleto, and Perugia, he displayed great energy, and was especially successful in the task of suppressing brigandage. In 1843 he was made Archbishop of Damietta *in partibus*, and sent as Nuncio to Brussels, where he exercised a powerful influence in the support of the Church against secularist attacks. At the end of 1845 he was recalled to undertake the administration of the See of Perugia, and made his entry there the following summer amid universal rejoicings. He ruled his diocese with great zeal, promoted education, and cared for the material wants of the poor by founding *monti di pietà* (loan associations under ecclesiastical direction). The year of revolutions (1848) brought many troubles to the Church in Perugia as elsewhere, which were met by the Archbishop with increased zeal and devotion. His services were recognized by Pope Pius IX., who made him a cardinal in 1853, carrying out an intention expressed by Gregory XVI. before his death. He was not, however, prominent in the Papal councils, being supposed to be hardly a *persona grata* to the powerful Antonelli. He continued his labors at Perugia under difficulties which increased after the annexation of Umbria to the dominions of Victor Emmanuel in 1860, and the promulgation of numerous laws inimical to religious interests. He raised his voice in energetic protest against what he considered the spoliation of the Church and against tampering with the law of marriage, and declined to join in a public reception to Victor Emmanuel when he visited Perugia. In 1877 he was brought to Rome to fill the important office of Cardinal Camerlengo, and a few months later, on the death of Pius IX., was called upon to perform the administrative functions attached to it during a vacancy in the Holy See. On February 20, 1878, he was chosen to fill the vacancy, taking the title of Leo XIII. in imitation of the Pope of his boyhood.

The combined learning, holiness, and statesmanlike sagacity displayed by him made his long, almost unprecedented, reign one of the most notable in the recent history of the Church. The great causes to which he devoted the last quarter century of his life are best marked by the numerous well-considered encyclicals in which he spoke through the Catholic hierarchy to the world. His first dealt with the study of theology, and commended the system of Saint Thomas Aquinas, the study of whose works he did all in his power to encourage, regarding it as the best means of meeting the difficulties of modern philosophy. In later ones he dealt acutely and broadly with social questions, the famous *Rerum Novarum* of 1891 being regarded as going a long way to meet the claims of modern socialism. Those on Christian marriage (1880) and on Freemasonry (1881) were more on traditional lines; but one which commended the diligent study of the Bible (1893) and those of 1894 and 1896 on the reunion of Christendom were of a nature to surprise and conciliate those who had no accurate knowledge of the teaching of the Roman Catholic Church. The restoration of Christian unity had always been specially near his heart. He displayed a particular interest in the English-speaking race, addressing a touching letter *ad Anglos* in 1894; and the decision of the commission which in 1896 pronounced that Anglican ordinations were invalid had an important bearing on the attitude of the High-Church party toward Rome. His recognition of the importance of this race, especially in the New World, was marked by the establishment of a permanent representative in the United States and one in Canada who were responsible immediately to him.

He maintained unwaveringly the attitude of his predecessor toward the Italian Government, considering it as a usurper in Rome and himself as a prisoner in the Vatican. Elsewhere his general policy was to support existing governments as representatives of law and order. Thus, though with some difficulty, he persuaded French Catholics to support the Republic; and he condemned the Nationalist 'plan of campaign' in Ireland. The *Kulturkampf* (q.v.) waged by the Prussian Government against the Holy See was brought to a close in 1887, the Papacy issuing from it triumphant. Leo XIII. reëstablished the ancient hierarchy of Scotland in 1878, and also established one in India. His constant efforts were devoted to the promotion of peace in the temporal order throughout the world; in 1885 he was able to secure it in a definite case by acting as arbitrator in the dispute which arose between Germany and Spain concerning the Caroline Islands. His life was of the simplest and most abstemious description, which doubtless had much to do with its prolongation. His interest in science and literature was always great, and marked for example by the provision of large sums for the Vatican Observatory. In 1883 he threw open the Vatican archives to all properly qualified scholars, expressing the conviction that the Church had nothing to fear from the study of the facts of history. His Latin style is of a high order, both in prose and verse: the composition of Latin poetry was one of his favorite relaxations. For his life, consult biographies by Bonghi (Città di Castello, 1884), O'Reilly (London, 1887), Weinand (2d ed., Cologne, 1892), T'Serclaes (Lille, 1894), Hall (New York, 1899), Narfon (Eng. trans., London, 1899); also Boyer d'Agen, *La jeunesse de Léon XIII.* (Tours, 1896); id., *La prélature de Léon XIII.* (ib., 1902); Goetz, *Leo XIII., seine Weltanschauung und seine Wirksamkeit* (Gotha, 1899); Keller, *Life and Acts of Leo XIII.* (New York, 1887). An edition of his *Carmina* was published in 1883; also *Poems, Charades, and Inscriptions of Pope Leo. XIII.* (ed. Henry, Philadelphia, 1902). His encyclicals have been published in Latin and German (Freiburg, 1881 seq.).

LEO I., Flavius (c.400-474). Byzantine Emperor from 457 to 474. He was born in Thrace, and ascended the throne at the close of the peaceful reign of Marcianus, for, though only an obscure military tribune at the time, he was the favorite of the all-powerful Aspar, commander of the guards. Having defeated the Huns in a battle in the Province of Dacia, in which a son of Attila was killed, he undertook together with Anthemius, Emperor of the West, an expedition to reconquer Africa, which at this time was held by the Vandals under Genseric (q.v.). The Roman fleet was destroyed by fire-ships. Aspar, being an Arian, was unpopular, and hence was suspected by the people of having had treasonable dealings with the Vandals, who were also Arians. Leo was glad of this opportunity to get rid of his too powerful subject, and had him treacherously murdered in 471. Leo has been generally called the Great, but this title was given to him merely on account of his orthodoxy. With more justice the Arians surnamed him Marcellarius (butcher). In 473 he associated with himself his grandson, Leo II., who, however, survived him only a few months.

LEO III., Flavius (c.680-741). Byzantine Emperor from 717 to 741. He was surnamed the Isaurian from his birthplace. Originally his name was Conon, which he dropped in later life. Early in life he had distinguished himself as a soldier. Anastasius II. appointed him in 713 commander of the troops in the East. On the deposition of Anastasius by Theodosius III., Leo remained faithful to the former, overthrew the usurper, and assumed the crown, March 25, 717. He was scarcely seated on the Imperial throne when the forces of the Caliph Solyman laid siege to Constantinople by land and sea; this siege lasted for a whole year, but was finally raised through the energy of Leo. The governors of several provinces had meantime rebelled, and it cost Leo several years of warfare before peace was restored to the Empire. In the great battle of Acroinon, in 740, he destroyed a large Mohammedan army and checked for many years the advance of Islam. He made many administrative reforms, completed the organization of the themes, reconstituted the army, placed the finances upon a firmer basis, and published codes of law for the army, for agriculture, and for commerce, as well as the civil code, the *Ecloga*. He is best remembered, however, by his strife against the use of images in the churches. (See Image-Worship.) Leo's edict against the images caused insurrections in Greece, which were soon repressed; but in Italy the opposition, headed by the Pope, was more vigorous and could not be subdued. Leo retaliated by confiscating the lands of the Papacy in the Greek Empire, and by placing the whole of Sicily, Calabria, Crete, and Illyricum, which had previously been under the authority of the Pope, under the Patriarch of Constantinople. This caused almost a complete rupture between the Pope and the Emperor. Leo died June 18, 741.

LEO V., Flavius (?-820). Byzantine Emperor from 813 to 820. He was surnamed the Armenian from his native country. He rose to the rank of general, and was raised to the Imperial office by the army. In 814 and 815 he decisively defeated the Bulgarians. He was an iconoclastic prince of the most pronounced type, caused the adoration of images to be abolished by the second synod of Constantinople in 816, and condemned to punishment those who persisted in it, exiling the Patriarch Nicephorus for the same cause. The weight of public sentiment was against him. In 817 he defeated the Bulgarians at Mesembria. He arrested Michael, surnamed the Stammerer, whom he suspected of treason, notwithstanding his former valuable services, and condemned him to death; but on Christmas night in 820, while he knelt in the chapel of his palace, he was murdered by the adherents of Michael. His reign is remarkable chiefly for the strict discipline which was infused by him into the administration of the civil government.

LEO VI., Flavius (866-911). Byzantine Emperor from 886 to 911. He was the son of Basil I., whom he succeeded. His reign was marked by a succession of reverses. Sicily was definitively lost, and the Empire was ravaged in many parts by the Mohammedans. Leo is credited with having written numerous poems and theological treatises. His most important work, however, is a treatise on military affairs, which was long celebrated. He had been tutored in his youth by the famous Photius, Patriarch of Constantinople, whom, however, he deposed as soon as he assumed the reins of government. He was surnamed Sapiens (the Wise) and Philosophus, though with little reason. Consult: Oman, *Byzantine Empire* (New York, 1892); Bury, *Later Roman Empire* (London, 1889); Gibbon, *Decline and Fall of the Roman Empire* (edited by Bury, London, 1896-1900); Finlay, *History of Greece* (London, 1877).

LEO, lā'ō, Friedrich (1851—). An eminent German classical philologist, born at Regenwald; professor at the University of Göttingen. He is editor of *Senecæ Tragœdiæ* (1878-79); *Venantii Fortunati Opera Poetica* (1881); *Plauti Comœdiæ* (vols. i., ii., 1895-96); author of *Plautinische Studien* (1895); *Die griechisch-römische Biographie nach ihrer literarischen Form* (1901); and numerous philological papers.

LEO, Heinrich (1799-1878). A German historian, born at Rudolstadt. He studied at Jena, where he took an active part in the student association of the period, and later went to Göttingen. In 1828 he became professor of history at the University of Halle. Among his early publications were: *Lehrbuch der Geschichte des Mittelalters* (1830); *Geschichte der italienischen Staaten* (1829-30); and *Zwölf Bücher niederländischer Geschichten* (1832-35). In his subsequent works he changed his position, adopted Hengstenberg as his leader, and energetically attacked the ideas of Hegel, which he had previously advocated. Under the influence of this reactionary tendency, he wrote *Lehrbuch der Universalgeschichte* (3d ed. 1849-55) and *Vorlesungen über die Geschichte des deutschen Volks und Reichs* (1854-66). Consult his autobiography, *Aus meiner Jugendzeit* (Gotha, 1880); and Schmidt, *Geschichte der deutschen Litteratur von Leibniz bis auf unsere Zeit* (Berlin, 1886-96).

LEO, Leonardo (1694-1756). An Italian composer, born in the Province of Lecce. He studied music at Naples under A. Scarlatti and Fago, and at Rome under Pitoni. After having been *maestro* at the cathedral in Naples, and at Santa Maria della Solitaria, he was appointed Court organist. As a teacher in the Conservatory of Saint Onofrio at Naples he trained many distinguished musicians; but he is famous as an operatic composer, although his Church music is superior to his dramatic. He wrote about sixty operas, of which *Solfonisbe* (1718) was the first and *Il nuovo Don Chisciotte* (finished 1748 by P. Gomez) was the last. Of his sacred compositions, which include oratorios, masses, motets, hymns, magnificats, etc., the best known is a *miserere* for eight-part choir *a cappella*. This has been frequently reprinted, but the bulk of Leo's work is still in manuscript. Consult Florimo, *La scuola musicale di Napoli e i suoi Conservatori* (2d ed., Naples, 1880-84).

LE'O AF'RICA'NUS (Lat., Leo the African; Ar. Al-Hasan ibn Mohammed al-Wazzan) (c.1485-?). An Arabian traveler and geographer, born in Granada, Spain. On the expulsion of the Moors from Spain, his parents went to Morocco, where he received an excellent education. When only sixteen years old he began his travels, which extended through Northern and Central Africa and Western Asia. While returning by sea from Egypt in 1517 he was captured by pirates, who presented him to Pope Leo X. In Rome he learned Latin and Italian, and, becoming a Christian, took the name Leo Joannes in honor of the Pope, who was his sponsor. At Rome he taught Arabic to Cardinal Egidio, the same who was taught Hebrew by Elias Levita. His work *Description of Africa* was for a long time the only source for the geography of the Sudan. It seems that he wrote it first in Arabic, but the original is no longer extant, and the author translated it himself into Italian (published by Ramusio, 1550). A Latin version was published by Florianus (Antwerp, 1556; Zurich, 1559; Leyden, 1632); a French version by Jean Temporal (Lyons, 1556; reëdited with notes by Ch. Shefer in *Recueil de voyages*, No. 15, Paris, 1898); and a German version by Lorsbach (Herborn, 1805). He also wrote *Tractatus de Vitis Philosophorum Arabum*, published by Hottinger (Zurich, 1664). He died in Tunis after 1526.

LEOBEN, lā-ō'ben. A mining-town in the Crownland of Styria, Austria, situated on the Mur, 44 miles by rail from Gratz (Map: Austria, D 3). It is surrounded by old walls with towers, and has an interesting fountain. It has an academy of mining and a higher gymnasium. In the vicinity are extensive mines of lignite, also iron-works. In a castle near Leoben were signed (April 18, 1797) the preliminaries of peace between Austria and the French Republic, leading to the Treaty of Campo Formio (q.v.). Population, in 1890, 8127; in 1900, 10,204.

LEOBSCHÜTZ, lā'ŏp-shụts. A town in the south of the Province of Silesia, Prussia, near the Zinna River, 20 miles north-northwest of Ratibor (Map: Prussia, G 3). It has manufactures of machinery, woolens, glass, and mineral water. There is also a considerably developed house industry. Population, in 1890, 12,586; in 1900, 12,627. Leobschütz existed as early as the tenth century, and was from 1524 to 1623 the capital of the Principality of Jägerndorf.

LEOCHARES, lē-ŏk'ȧ-rēz (Lat., from Gk. Λεωχάρης). A famous sculptor, possibly an Athenian, who flourished about the middle of the fourth century B.C. One of his earliest works, the portrait of Isocrates, was made before B.C. 355, and he was one of the artists employed on the sculptures of the Mausoleum (q.v.), begun in B.C. 352. We hear of three statues of Zeus by him, one of which was subsequently placed on the Roman Capitol, where it is praised by Pliny as '*ante cuncta laudabilem*.' His most famous works seem to have been executed for the royal family of Macedon, after the battle of Chæronea (B.C. 338). In the Philippeum at Olympia were five gold and ivory statues of Philip, Alexander, Olympias, Amyntas, the father of Philip, and his wife Eurydice. In collaboration with Lysippus (q.v.) he made the bronze group of the lion-hunt of Alexander, which

Craterus dedicated at Delphi in commemoration of his rescue of Alexander on such an occasion. A reminiscence of this group seems preserved in a relief from Messene, now in the Louvre, and some authorities attribute one type of the portraits of Alexander to an original of Leochares. An undoubted copy of a work by this artist, though on a reduced scale, is the group of "Ganymede Carried Off by the Eagle of Zeus," now in the Vatican. Many very good authorities attribute to him the original of the Apollo Belvedere, and some also the Artemis of Versailles in the Louvre. Both these attributions are doubtful. In addition to the standard histories of Greek sculpture, consult: Winter, in the *Jahrbuch des deutschen archäologischen Instituts*, vol. vii. (Berlin, 1892); and Furtwängler, *Masterpieces of Greek Sculpture* (London, 1895).

LE′O DIAC′ONUS (Lat., Leo the Deacon) (c.950-c.1000). A Byzantine historian. He was born at Caloë in Ionia and came to Constantinople about 969, in which year he saw the deposition of Nicephorus Phocas. Twelve years afterwards, as one of the Court priests, he went with Basil II. against the Bulgarians. His history contains valuable material for the years 759-775, but it is poorly written and patriotically partial. It is included in the Bonn *Corpus Historiæ Byzantinæ* (1828). Consult Hirsch, *Byzantinische Studien* (1876).

LEOMINSTER, lĕm′stẽr. A market-town in Herefordshire, England, 12 miles north of Hereford, on the river Lug (Map: England, D 4). It is the centre of one of the most celebrated cattle-breeding districts in Europe, and has wool-stapling and leather establishments, manufactures of gloves and hats, and a trade in hops and cider. The town maintains markets and a free library. Leominster originated in a Saxon monastery, and received its charter of incorporation from Queen Mary. Population, in 1901, 5900.

LEOMINSTER, lĕm′ĭn-stẽr. A town, including several villages, in Worcester County, Mass., 5 miles south of Fitchburg; on the Nashua River, and on the New York, New Haven and Hartford and the Boston and Maine railroads (Map: Massachusetts, D 2). It has a public library of about 17,700 volumes, and a park. The principal manufactures include piano-cases, baby-carriages, shirts, buttons, combs, horn goods, furniture, woolen goods, leather board, paper, etc. The government is administered by town meetings. The water-works are owned and operated by the municipality. Population, in 1890, 7269; in 1900, 12,392. Settled in 1725, Leominster was part of Lancaster until incorporated as a separate town in 1740. In 1873 it suffered severely from fire. Consult Emerson, *Leominster, Massachusetts* (Gardner, Mass., 1888).

LEÓN, or **LEÓN DE LOS ALDAMAS**, lā-ōn′ dā lōs äl-dä′mäs. A city of Mexico, in the State of Guanajuato, 32 miles west of Guanajuato (Map: Mexico, H 7). It is a well-built town, situated in a rich agricultural district, and has a fine public square, a cathedral, convents and schools, and one of the largest and finest theatres in the country. León is a flourishing industrial centre, and has an extensive commerce in wheat and other grains, and manufactures leather saddlery, cottons, and woolens. Population, 50,000. The town was founded in 1576 and became a city in 1836.

LEÓN. A city of Nicaragua, finely situated in a picturesque district, 13 miles from the Pacific coast and 45 miles northwest of Managua (Map: Central America, D 4). It has a cathedral, an episcopal palace and a university. León was founded by Francisco Hernandez in 1523, on the shore of Lake Managua, opposite Mount Momotombito, but was removed west in 1610 to its present site. It was formerly the capital of the Republic and is still the largest city, though its population has declined from 60,000 to 30,000, including the Indian suburb of Subtiaba.

LEÓN. A former kingdom in the northwestern part of Spain, embracing the modern provinces of Salamanca, Zamora, and León, and bounded on the north by Asturias, on the east by Old Castile, on the south by Estremadura, and on the west by Portugal and Galicia. Its area is 14,775 square miles. The river Duero crosses the region from east to west, among its affluents being the Esla on the right and the Tormes on the left. From the central valley the land rises in broad and level terraced plateaus toward the rugged granite mountains of the Sierra de Francia and the Sierra de Gata on the southern boundary; and a more uneven region, cut by narrow valleys, rises toward the lofty Cantabrian chain on the northern boundary. The climate is extremely varied, almost subtropical in the valley of the Duero, changing to a severe continental climate with not unusual snows on the southern highland and a more humid and unstable one toward the north. The vegetation varies as much as the climate; oranges, lemons, olives, and vines thrive in the central valley, while the slopes yield abundant crops of wheat and other cereals and a fine quality of flax. The whole region, with the exception of a sterile plateau in the northeast, is well watered and the highlands are clothed with extensive forests, in which the oak, walnut, and chestnut are predominant. The mineral wealth is not very large except in the northwest, where considerable quantities of coal and iron and some copper are mined. The industries are unimportant, though there are some flour and textile mills and iron-works. Trade is more active, and the exports include coal, iron, building-stone, timber, cork, hides and cattle, linen and woolen goods, olives, and wines. The inhabitants are of pure Spanish descent, proud, indolent, and ignorant, as well as hospitable and brave. The population in 1887 numbered 975,181, and in 1900, 1,007,839.

History. León first appears in history as an independent kingdom about 910, when the Kingdom of Asturias (q.v.) was divided among the three sons of Alfonso III., Garcia receiving León. It suffered in the following years to a great extent from the Arabs, for the various rulers were weak, and rebellions were frequent. The first signs of vigor appeared under Alfonso V. (999-1027), who is known in Spanish history as the Restorer of León. In 1037 the male line of the House of León became extinct, and Ferdinand I., King of Castile, succeeded. His son, Alfonso VI., the Valiant, wrested large territories from the Mohammedans. Until 1157 the history of León is a part of that of Castile (q.v.). In 1157 Alfonso VIII., known as the Emperor, died, and León became again an independent kingdom under his son Ferdinand. His son was Alfonso IX., who married his cousin Berengaria of Castile in 1197 without Papal license, so that Innocent III. placed the whole country under an interdict. For seven years the couple remained firm, but finally separated, and a long series of wars between León and Castile began. In 1217 Berengaria became Queen of Castile in her own right, but immediately abdicated in favor of the eldest son of her union with Alfonso of León, Ferdinand. In 1230 he also succeeded to the throne of León, ruling the two countries as Ferdinand III. León and Castile were never again separated.

LEÓN. The capital of the Spanish province of the same name, situated near the confluence of the rivers Bernesga and Torio, in a beautiful wooded plain 81 miles northwest of Valladolid, and on the railroad from the latter place to Gijón (Map: Spain, C 1). Part of the old Roman wall, twenty feet thick, is still standing, and outside of this is another wall built in the fourteenth century. The streets are crooked and narrow; but there are a number of interesting old buildings. The cathedral is a masterpiece of Gothic art. It was begun in the thirteenth century and finished at the beginning of the seventeenth, but, owing to a defect in its construction which threatened its ruin, an extensive restoration was begun in 1843. The interior is rich in sculptures and mural paintings and contains the tomb of King Ordoño II. of León. The two other architectural monuments of León are the Church of Saint Isidore, in the Byzantine style of the twelfth century, containing the tombs of most of the kings of León, and the Convent of San Marcos, also dating from the twelfth century, but rebuilt in 1514. The latter has a beautiful and richly sculptured façade, and is the principal seat of the Order of Santiago; a part of it is now occupied by the municipal archæological museum. Besides this museum León has a number of educational institutions, such as the provincial library, the institute for secondary education, a normal school, and a veterinary school. The industry and trade of the city are unimportant. Population, in 1887, 13,446; in 1900, 17,022.

León was founded by the Romans as a military garrison and called *Legio Septima Gemina*, the word *legio* being later confused with *león*. It was twice captured and held by the Arabs in the ninth century, but recaptured, first by Alfonso I., and the second time by Ordoño I. In the beginning of the tenth century Ordoño II. made it the capital of the Kingdom of León. Even after that it was continually threatened, and once nearly destroyed by the Arabs. In 1808 the city was sacked by the French.

LE′ON. A town and the county-seat of Decatur County, Ia., 70 miles south of Des Moines; on the Keokuk and Western and the Chicago, Burlington and Quincy railroads (Map: Iowa, D 4). It has considerable trade as the centre of a fertile agricultural and stock-raising district. Population, in 1890, 1422; in 1900, 1905.

LEÓN, lā-ōn′. A town of Panay, Philippines, in the Province of Iloilo, situated about 15 miles northwest of Iloilo (Map: Philippine Islands, G 9). Population, in 1898, 13,950.

LEÓN, Isla de. A long, narrow island on the southwest coast of Spain, containing the cities of Cadiz and San Fernando (Map: Spain, B 4). It is ten miles long and two broad, and is separated from the mainland by the narrow deep channel of San Pedro, spanned by two bridges, one carrying a railroad. The surface of the island is flat, and covered with sand-dunes and salt marshes.

LEÓN, Antonio (1794-1847). A Mexican soldier, born in Huajuapam. He was at first a Royalist, but afterwards joined the insurgent forces and did valuable service for their leader Iturbide, who made him lieutenant-colonel as a reward for his capture of Tehuantepec in 1821. But when Iturbide took advantage of the plan of Iguala and proclaimed himself Emperor, León supported General Bravo and the Republican opposition. Afterwards he served in the Constituent Congress of 1824, as Deputy from Oajaca. He took an active part in suppressing the numerous insurrections that followed the proclamation of the Republic and afterwards fought in the war with the United States at Padierna and Molino del Rey, where he was killed.

LEÓN, Fray Luis de (1527-91). A Spanish poet and mystic, born at Belmonte in La Mancha. He early entered the Augustinian Order, was trained at the University of Salamanca, and was there elected to the chairs of Thomistic philosophy and of theology. His abilities as a theologian and as a linguist soon gained him great repute. In 1572, however, he was accused of having impugned the validity of the Vulgate and of having violated the ecclesiastical law which forbade the publication of unauthorized translations of the Bible. It seems that he had rendered the Song of Songs (Song of Solomon) into Spanish for the benefit of a certain nun, but the publication had been brought about by an enemy without León's knowledge or consent. He was detained in prison at Valladolid until 1576, when he was discharged. He employed the period of his imprisonment in writing. When released he was reinstated with honor in his post at Salamanca. He continued at Salamanca for some time, became vicar-general of his Order, and finally provincial of the Augustinians of Castile. Besides works in Latin, León produced much in Spanish prose and verse. Of his works in prose the most important are: The *Nombres de Cristo*, discussing the various appellations given to the Saviour in the Scriptures; the ***Exposición del libro de Job;*** a Spanish translation of his Latin commentary on the Song of Solomon; and a treatise on wifely duties, the *Perfecta Casada*. In all these he displays the humanistic bent of one well acquainted with the Greeks and Latins. His poetry has an undying charm. Besides his original lyrics, his verse includes translations of classics (e.g. from Horace, Vergil, Tibullus, Pindar, Euripides, Seneca), modern works (*canzoni* of Bembo and Giovanni della Casa and imitations of Petrarch), and translations from sacred sources (the Psalms, Job, Proverbs, the *Pange Linguam*, the Song of Solomon). Consult the edition of León published at Madrid, 1804-16, by Merino; J. Gonzales de Tejada, *Vida de Fray Luis de León* (Madrid, 1863); C. A. Wilkens, *Fray Luis de León* (Halle, 1866); J. D. M. Ford, *Luis de León, the Spanish Poet, Humanist, and Mystic* (in the Publications of the Modern Language Association of America, vol. xiv., No. 2). Henry Phillips (Philadelphia, 1883), Bryant, and others have made English verse renderings of some of León's lyrics. An edition of the *Perfecta Casada* appeared at Chicago in 1903.

LEÓN, Ponce de. See Ponce de León.

LEONARD, lĕn′ẽrd, Daniel (1740-1829). An American jurist, born at Norton, Mass. He graduated at Harvard in 1760, studied law, was elected to the General Court, and was at first a stanch Whig. Becoming alarmed, however, at the lengths to which the Whigs seemed to be going, he became a Loyalist. In 1774-75 he published in a Boston newspaper a series of seventeen papers over the signature *Massachusettensis,* to which John Adams replied over the signature *Novanglus.* The papers dealt chiefly with the legal aspects of the rights of the British Parliament over the colonists, and have been pronounced to be perhaps the clearest and strongest statement of the British position made anywhere in the colonies. Though the authorship was not fixed upon him, a mob fired into his house at Taunton, and he was forced to remove his family to Boston in 1776. On the British evacuation in 1779 he accompanied the army to Halifax, and went from there to London. His name was in the list of those sentenced to banishment by Massachusetts in 1778 and to confiscation of property in 1779. For many years he served as Chief Justice of the Supreme Court of Bermuda, but died in London. Mr. Adams republished the controversy, *Novanglus and Massachusettensis* (Boston, 1819), but even at that date thought that the letters were written by Jonathan Sewall.

LEONARDO DA VINCI, lā′ō-när′dō dȧ vēn′chē. See Vinci, Leonardo da.

LEONARDO OF PISA. See Fibonacci.

LEONCAVALLO, lā′ōn-kȧ-väl′lō, Ruggiero (1858—). An Italian composer, born in Naples, and educated at the Conservatory of Music in that city. Together with Mascagni (q.v.) he labored zealously for the advancement of the newer Italian music, and although educated under such conservative Italian teachers as Peri, Simonetti, and Rura, he more than any other Italian composer of his day gave evidence of German influence, and so cleverly welded together Italian melody and German harmony as to have been regarded by many as the legitimate successor of Verdi. He was an enthusiastic admirer of Wagner, and under his encouragement wrote the trilogy *Crepusculum,* an historic play of the Italian Renaissance, the preparation for which occupied him six years. He is principally known in England and America by his two-act opera *I Pagliacci* (1892), the prologue to which is a favorite concert number, and *La Bohème* (1897). Other compositions are *Songe d'une nuit d'été,* and *Tommaso Chatterton,* an opera which on its first presentation was a failure, but on its arrival in Rome in 1896 was a great success. His compositions include several works for piano and orchestra, and a symphonic poem, *Serafitus-Serafita.*

LEONFORTE, lā′ōn-fôr′tā. A city in the Province of Catania, Sicily, 2072 feet above the sea and 50 miles by rail west of the city of Catania (Map: Italy, J 10). An interesting highway, 63 miles long, which was the route pursued in the Middle Ages by the Arabs on the raids from Palermo into the interior, leads from Leonforte northwest through the mountains to Termini Imerese. Leonforte markets wine, oil, grain, sulphur, salt, and other minerals, and has important cattle fairs, June 13th and August 15th. Population (commune), in 1881, 16,009; in 1901, 19,751.

LEONHARD, lā′ōn-härt, Rudolf (1851—). A German jurist, born at Breslau. He studied at Heidelberg, Berlin, and Giessen, was in the Prussian Government service from 1872 to 1880, established himself as docent in Berlin in 1878, and became professor successively at Göttingen (1880), Halle (1884), Marburg (1885), and Breslau (1895). His more important publications include: *Der Irrtum bei nichtigen Verträgen nach römischem Recht* (1882-83); *Die Universität Bologna im Mittelalter* (1888); *Roms Vergangenheit und Deutschlands Recht* (1889); *Institutionen des römischen Rechts* (1894); *Der Erbschaftsbesitz* (1899); *Die Hauptziele des neuen bürgerlichen Gesetzbuchs* (1900).

LEONHARDT, lā′ōn-härt, Gerhard Adolf Wilhelm (1815-80). A German jurist. He was born in Hanover, studied jurisprudence at Göttingen and Berlin, and entered the service of the Hanoverian Government in 1837, becoming Minister of Justice in 1865. After the annexation of Hanover to Prussia, he was first made president of the High Court of Appeals at Celle, and afterwards Chief Justice of the High Court of Appeals for the new provinces. In 1867 the King gave him a seat in the Prussian Upper House, and shortly afterwards he received the appointment of Prussian Minister of Justice. He remained in office till 1879. Leonhardt did much to improve the criminal code of Germany. His principal work is *Die Justizgesetzgebung des Königreichs Hannover* (3d ed. 1859-60).

LEONI, lā-ō′nē, Leone (c.1509-85). An Italian goldsmith, medalist, and sculptor, born at Arezzo. The name of his master is not known. From 1538 until 1540 he worked in Rome, as an engraver of money, and afterwards he went to Milan, where he worked in the same capacity under the patronage of Alfonso d'Avalos. Still later he was appointed medalist and sculptor to the Emperor Charles V. Among his medals, all of superior workmanship, is one made for Michelangelo. He made the monument of Jacopo de' Medici, in the Milan Cathedral, and many statues and busts in bronze and marble. Most of his works are to be found at Vienna, and in the Prado Museum, Madrid.—His son Pompeo (?-1610) lived nearly all his life in Spain, and executed several works for Charles V. and Philip II. These include fifteen statues of saints in the Escorial, and statues on the tombs of Charles, Philip, and their queens in the church of the same palace.

LEON′IDAS I. (Lat., from Gk. Λεωνίδας). King of Sparta, son of Anaxandrides. He succeeded his half-brother, Cleomenes I., about B.C. 491. When, in B.C. 480, the Persian monarch Xerxes approached Greece with an immense army, Leonidas was sent with 300 Spartans and a small auxiliary force to occupy the narrow pass of Thermopylæ, which lay between the sea and Mount Callidromus, a spur of the range of Œta. For two days the Greeks successfully resisted the overwhelming force of the Persians and frustrated every attempt to force the pass. At the end of the second day's conflict, a Malian named Ephialtes repaired to the Persian camp and gave information of a secret path across the mountains which the Greeks had neglected to occupy, and at daybreak on the next day Leonidas learned that the Persians were pouring across the mountains to attack him in the rear. Then Leonidas sent away his auxiliaries, gathered his 300 Spartans, together with their attendants, about him, and prepared to defend his post. In the fight that ensued Leonidas himself soon fell, but the remaining Greeks retreated to a hillock near the road and made their last stand. They fell, fighting, to a man.

LEONIDAS II. (c.285-236 B.C.). A King of Sparta. He was a son of Cleonymus, and served abroad under the Kings of Syria and Egypt. He brought back to Sparta an Eastern wife and Eastern ideas; and was dethroned by the ephors (241) because of his opposition to the reforms of King Agis IV. (See AGIS.) He came back to power in 240, after a brief exile at Tegea; put King Agis to death; and ruled alone for four years in a tyrannical and despotic manner. He was succeeded by his son, Cleomenes II.

LEONIDAS OF ALEXANDRIA. A Greek poet under Nero and Vespasian. In the Greek Anthology, forty-three epigrams of very little merit are ascribed to him.

LE'ONINE CITY (It. *Città Leonina*). A part of Rome on the right bank of the Tiber, embracing the Vatican, the Castle of Sant' Angelo, and the poor quarter called the Borgo. It was inclosed by Leo IV. with high walls as a defense against the Saracens, and became a refuge for the popes in later times. It was destroyed after the fall of Rienzi, but was restored during the next century. It now forms the Fourteenth Ward of modern Rome.

LEONINE VERSES. The name given to the hexameter and pentameter verses, common in the Middle Ages, which rhymed at the middle and end. They are said to have been so named after a canon of the Church of Saint Victor, in Paris, about the middle of the twelfth century, or, according to others, after Pope Leo II., who was a lover and improver of music. But leonine verse can be ascribed to no single man as the inventor. It is rather one of the incidentals in the passage from the quantitative verse of the ancients to the accented verse of modern literature, and still more from non-rhyming to rhyming verse. Indeed, traces of leonine verse appear even in the Roman poets themselves, especially in Ovid's *Epistles*. In the Middle Ages it was widely employed in Latin hymns and secular poetry, in epitaphs and epigrams. An analogous effect is produced in English poetry by the use of rhyme in the middle of the line. It was employed with effect by Tennyson in "The Bugle Song"—

> "The spendour falls on castle walls,"

and earlier by Shelley in "The Cloud"—

> "That orbed maiden with white fire laden."

It is perhaps oftener used by Kipling than by any other English poet.

LE'ONNA'TUS (Lat., from Gk. Λεοννάτος) (?-B.C. 322). A Macedonian commander. He was one of the generals who avenged the death of Philip upon his assassin Pausanias (Diodorus, xvi. 94). He accompanied Alexander the Great in his invasion of Persia in B.C. 334, and it was through his personal bravery that Alexander's life was saved during the attack on the city of the Malli. At the death of his chief he obtained the satrapy of Phrygia Minor, but soon afterwards was killed in the battle near Lamia while aiding Antipater against the revolted Greeks.

LEONORA, lā'ō-nō'rȧ. (1) In Beethoven's opera *Fidelio*, the wife of Fernando. She gains access to her husband's prison in male attire and under the name of Fidelio. (2) In Verdi's *Il Trovatore*, a princess in love with Manrico. She kills herself to avoid marriage with his uncle, to whom she promises herself, in order to save Manrico's life. (3) The heroine of Donizetti's *La Favorita*. She marries Ferdinando, who is ignorant that she has been the King's mistress, and who on learning the fact puts her away.

LÉONORE, OU **L'AMOUR CONJUGAL,** lā'ō'nōr' o͞o lȧ'mo͞or' kôɴ'zhụ'gȧl' (Leonore, or conjugal love). A French opera by Bouilly, with score by Gaveaux (1798). The German translation furnished the libretto for which Beethoven composed his only opera, *Fidelio*, at first also called *Léonore*.

LEÓN PINELO, lā-ōn' pē-nā'lō, ANTONIO DE. A Spanish author of the seventeenth century. He was born at Córdoba, Peru (now Argentina), in the last quarter of the sixteenth century. He studied law in Lima, but spent the greater part of his life in Spain, where he was prominently connected with the administration of Spanish colonies as member of the Supreme Council of the Indies up to 1653. At that date he became judge of the Contratación in Cadiz. His more important works were: *Epítome de la biblioteca oriental y occidental, náutica y geográfica* (1629; revised by De Barcia, 1737-38), the earliest bibliography of the Spanish colonies; and the great colonial code, *Recopilación de las leyes de Indias* (1680).

LEON'TES. The King of Sicily in Shakespeare's *Winter's Tale*. In a fit of jealousy he attempts to poison his guest Polixenes, the King of Bohemia, and casts his wife, Hermione, into prison, where she gives birth to a daughter. Leontes orders the child to be exposed, but in the dénouement she is discovered in the person of Perdita, who marries Florizel, the son of Polixenes.

LE'ONTI'NI. The ancient name of Lentini (q.v.), a city in Sicily.

LEONTIUS (lē-ŏn'shĭ-ŭs) **OF BYZANTIUM,** bĭ-zăn'shĭ-ŭm (c.485-c.543). An ecclesiastic of very uncertain date. Many works of about the same date bear the name Leontius, with the epithets *Byzantinus*, *Cyprius*, *Hierosolymitanus*, *Presbyter et Abbas Sancti Sabæ*, and *Neapolitanus*. It is possible that these epithets, with the exception of *Neapolitanus* and *Cyprius* (which refer to a bishop of Naples and Cyprus, of the seventh century, author of a life of Saint Simeon), were used by a monk born at Byzantium and a teacher there, and afterwards a priest at the Abbey of Saint Sabas near Jerusalem. There is further confusion possibly with a Scythian monk of the same name; if not we must suppose that the Byzantine monk lived in Scythia, was originally a Nestorian—although he afterwards attacked this sect—and that he came to Rome and Constantinople about 519 with Scythian monks who took part in the theopaschitic controversy. Leontius wrote: *De Sectis*, or *Scholia* in ten sections (πράξεις), of which a later recension is published in Galland's *Bibliotheca Patrum*, vol. xii. (1778), a valuable history of heresy; and *Contra Eutychianos et Nestorianos* and *Adversus Argumenta Severi*. Consult Loofs, *Leben von Leontios* (1887).

LEONZIO PILATO, lā-ôn′tsē-ō pē-lä′tō, or LEO PILATUS (?-c.1366). A scholar born either in Thessalonica or Calabria (probably in the latter place), at a date unknown; came to Florence in 1360, and was employed by the Republic at the request of Boccaccio as a teacher of Greek. He made the first modern translation of Homer into Latin, and was the first to lecture in public upon the great poet in Western Europe. He went to Venice, where he met Petrarch, then a pupil of Barlaam. From Venice he went to Constantinople, intending to return to Italy, but he was stricken by lightning on the voyage across the Adriatic (c.1366). He furnished Boccaccio with the materials for his treatise on the genealogy of the heathen gods, and it was Boccaccio's excess of confidence in Leonzio, who was more or less a charlatan and not skilled in classic Greek, that led the humanist to introduce so many absurdities into his work. Consult: Voigt, *Die Wiederbelebung des klassischen Altertums*, vol. ii. (3d ed., Berlin, 1893); and Gibbon, *Decline and Fall of the Roman Empire*, vol. viii.

LEOPARD (OF. *leopard*, Fr. *léopard*, from Lat. *leopardus*, from Gk. *λεόπαρδος*, *λεοντόπαρδος*, *leontopardos*, leopard, from *λέων*, *leōn*, lion + *πάρδος*, *pardos*, pard). The leopard (*Felis pardus*) ranks third in size among the Old World cats, but has the widest distribution of all. In all its history the name 'leopard' has been confused with the words 'pard' and 'panther,' and even at the present day it is a common belief that a pard is a panther and that the latter is a different animal from the leopard. Among sportsmen it has been customary to use the term 'panther' for all unusually large leopards. As a matter of fact the leopard was called 'pard' or 'panther' by the ancients, and the word leopard was probably originally applied to the cheeta (q.v.), but was incorrectly transferred to the panther and has now almost wholly superseded that name.

Although exceeded in dimensions by the lion and tiger, the leopard ranks with them in grace, quickness, and ferocity. It is the most variable in color and size of any of the large cats, a fact no doubt due to its extensive range, for the leopard is found throughout the continent of Africa, and from Palestine to Northern China and Japan, and in Borneo, though it does not occur north of the Himalayas. Mivart gives the average length of the body and head as about three feet ten inches, and of the tail as three feet eight inches. The pupil is round. The color is buff of some shade, sometimes tawny, sometimes rufous, passing into white on the under parts and on the inner sides of the limbs; everywhere are spots, comparatively small, roundish, and very black on the under parts, but browner and collected into rings and rosettes on the back and sides. These differ from the spottings of the jaguar (q.v.) in being less definitely arranged, and in not falling into rings inclosing one or more spots. But the distinctness of the markings varies greatly, and they are less evident in cubs than in the adults. The tail is ringed. The so-called 'black' leopard is a not uncommon melanistic variety in which the ground color has become so nearly black that the markings can be detected only with difficulty. Black leopards are found most commonly in Southern Asia. They are occasionally bred in captivity, frequently born in the same litter with spotted ones; and they seem invariably to manifest a far more savage and irreconcilable disposition than even the normal variety. A Malaysian variety is black with fulvous spots—a reversal of the normal coloration. Great variability exists in the length of the coat; and some naturalists regard the snow-leopard of the high Himalayas as merely a variety, while a 'maned' form is said to exist in Central Africa.

The haunts of the leopard are usually in wooded districts, but, although it climbs trees easily, it prefers the ground or the large limbs of low trees, whence it can spring easily on its prey. Both haunt and habits vary greatly according to the region in which the animal lives and the sort of prey upon which it depends. The leopard of the East Indian or West African jungles is different in many ways from that of the rocky but comparatively open districts of South Africa or Somaliland, or the high plains of Persia. Everywhere it sustains its reputation for a quickness, ferocity, cunning, and destructiveness greater than that of either lion or tiger; yet its strength is by no means equal to theirs. Individuals, however, exhibit contrasting temperaments, as in other species.

Leopards feed chiefly upon mammals, as antelopes, deer, monkeys, goats, and dogs, and of the last named, like other great cats, they are especially fond. There is no other enemy so feared by monkeys, and none to which they so often fall a prey. Leopards also capture large ground-birds, such as pea-fowl; persistently raid herds of cattle and goats; and occasionally attack human beings, chiefly women and children. Rarely an old leopard becomes a true 'man-eater,' but once having discovered how easily it can secure human victims, is more dangerous than a man-eating tiger or lion, for it is far more stealthy, cunning, and persistent. Hunters find the pursuit of the leopard not only as exciting, but often as dangerous, as that of the tiger, and the methods pursued are in India substantially the same. See TIGER-HUNTING; compare CHEETA.

The leopard is usually regarded as among the most intractable of animals, yet a few have always been among the tamed and performing troupes of the animal-trainers; but as they grow old they are far less trustworthy than any other of the big cats. The leopard makes its home in a cave or dense thicket, or huge hollow stump; and there the female annually bears three or four young. They thrive and breed well in captivity. Their hides are in constant demand in the fur market, and command a high price. Throughout the whole of Central Africa the skin of the leopard is deemed a suitable ornament for persons of princely rank, and nowhere is it more readily admitted among the insignia of royalty than with the Niam Niam (q.v.).

Fossil remains of the leopard have been found in Pleistocene deposits in various parts of Europe, and there is even some evidence of its former occurrence in Great Britain.

BIBLIOGRAPHY. The best general account is "The Leopard and Panther," in Porter's *Wild Beasts* (New York, 1894); beyond that consult the authorities referred to under Lion and Tiger.

LEOPARD. In heraldry (q.v.), the lion represented passant gardant.

LEOPARD CAT. A rare and little known cat (*Felis Bengalensis*) of Northern India, the Malay Peninsula, Sumatra, and Java, which is about two-thirds the size of the leopard. Its coloration resembles that of the leopard, but there are four longitudinal spots or stripes on the forehead, continued backward in lines to the shoulders, and thence traceable in broken lines along the back. All the other spots are rather large, and show a tendency to fall into rows. The limits and affinities, as well as the habits of this animal, are little understood. Consult Mivart, *The Cat* (New York, 1892).

LEOPARD CATFISH, or Suravi. See Catfish.

LEOPARD FROG (so called from the spotted coloration). The common spotted green frog of North America (*Rana virescens*)—the most widely distributed of all American frogs, and found from Athabasca Lake to Southern Guatemala, except on the coast of California. It is the 'shad' frog of New England. See Frog.

LEOPARDI, lā'ō-pär'dē, Giacomo, Count (1798-1837). An Italian poet, born at Recanati, June 29, 1798, of an old noble family then impoverished. Leopardi's childhood was a sad and loveless one, and from a very tender age he gave himself up with such energy to the study of the classics and of three or four modern languages, that he greatly impaired his health, delicate from early youth, and brought on those chronic ailments that embittered all his later life. In 1817 he began his correspondence with Pietro Giordani, and to this same year belongs his first love affair, which inspired his first poems (*Il primo amore, Spento il diurno raggio*, and *Io qui vagando*). A prey to an overpowering melancholy, he made an unsuccessful attempt to escape from his father's house in 1819. In 1822, however, he obtained leave to go to Rome, and then began a period of constant wandering to and fro, during which the poet, a prey to unceasing physical torments, found life to be a series of disenchantments. Sojourning in Rome, Milan, Bologna, Florence, Pisa, and at intervals in Recanati, he finally went to Naples, where he died, June 14, 1837. Scantiness of money hampered him always, and his bodily infirmities prevented him from accepting the independent position which he might have achieved, when his repute as a philologist prompted the statesman and scholar Bunsen to offer him a university professorship in Germany. A deep student of Greek and Latin, and conversant also with French, Spanish, and English, Leopardi produced philological works notable for the time, but now, with the exception of the commentary on Petrarch, rather antiquated. In his earlier years he wrote Greek and Latin with much more ease and precision than Italian, and it was only by a systematic study of the style of Italian classics that he later acquired skill in handling his native language. There are two periods recognizable in Leopardi's lyric activity. In the first of these, which extends from about 1816 to 1824, and embraces some twenty-two compositions approved by the author, his pessimism is first formed and developed, and he rests more particularly under the influence of the Latin classics; in the second period, which, after a couple of years given up to writing in prose, begins in 1826 and occupies the rest of his life, he carries his pessimism still further, and ends by affirming the universality of suffering. A feature of this later poetic manner is a rather frequent imitation of Petrarch. As to metrical structure, Leopardi was most inclined to the use of blank verse (*versi sciolti*), but in some of his best pieces he even employed internal rhyme; in general, his rhyme schemes are of an intricate nature. Of his various prose works the author gave his final approval only to the *Operette morali* and a few of the *Volgarizzamenti*, the former being original works of a philosophic nature, and the latter his translations from the Greek. There appeared posthumously the prose *Pensieri*. His critical powers are best illustrated in his *Crestomazia italiana*, containing selected passages from the most representative Italian writers of every century. For a knowledge of the inner man, nothing is more important than the *Epistolario*, a collection of his letters extending from 1812 to a few days before his death, familiar in their style and notably sincere in tone.

Consult editions of the poems, *All' Italia* and *Sul monumento di Dante* (Rome, 1819); that of the *Ad Angelo Mai* (Bologna, 1820); the *Canzoni del conte Giacomo Leopardi* (ib., 1824); the *Versi del conte Giacomo Leopardi* (ib., 1826); the *Conti Giacomo Leopardi* (Florence, 1831); the commentary by A. Straccali (2d ed., ib., 1895). The most complete editions are those of G. Chiarini (Florence, 1886) and of G. Mestica (ib., 1886). The first edition of the *Epistolario* was that of Florence, 1849; consult the 5th ed. by G. Piergili, Florence, 1892. The best editions of the *Operette morali* (first published at Milan, 1827) are those of G. Chiarini (Leghorn, 1870) and G. Mestica (Florence, 1889). Consult the commentaries by N. Zingarelli (Naples, 1895) and I. Della Giovanna (Florence, 1895). Biographical and critical treatises are: G. I. Montanari, *Biografia del conte Giacomo Leopardi* (Rome, 1838); Saint-Beuve, *Portraits contemporains*, vol. iv.; C. Rosa, *Della vita e delle opere di Giacomo Leopardi* (Ancona, 1880); A. Ranieri, *Sette anni di sodalizio con Giacomo Leopardi* (Naples, 1880); C. A. Traversi, *Studi su Giacomo Leopardi* (ib., 1887); L. Cappelletti, *Bibliografia Leopardiana* (2d ed., Parma, 1882); F. De Sanctis, *Saggi critici* and *Nuovi saggi critici* (Naples, 1868, 1879); I. Della Giovanna, *La ragion poetica dei Canti di Giacomo Leopardi* (Verona, 1892); G. A. Cesareo, *Nuove ricerche su Giacomo Leopardi* (Turin, 1893).

LEOPARD LIZARD. See Collared Lizard.

LEOPARD MOTH. A moth (*Zeuzera pyrina*), of European origin, famous for the damage which its larva does by boring into the limbs and branches of forest and shade trees. It has been accidentally introduced into the United States, and has been established in the vicinity of New York City. It belongs to the family Cossidæ, the larvæ of all of which are wood-borers. The female has a wing-expanse of two inches, and is white in color spotted with black. The eggs are laid in groups attached to the bark, and the larvæ bore into the branches, either killing them or weakening them so that they readily break in a high wind.

LEOPARDO, lā'ō-pär'dō, ALESSANDRO (?-c.1521). An Italian sculptor, born in Venice. Little is known of his life. His first work was the mausoleum of the Doge Andrea Vendramin, in the Church of Saint John and Saint Paul, in Venice. In this work he was assisted by Tullio Lombardi. In 1487 he was exiled from the city for some unknown indiscretion, but three years afterwards was recalled to complete the statue of Colleoni, left unfinished by Verrocchio. This magnificent figure was cast in bronze by Leopardo, and owes much of its exquisite detail to his art. From 1503 until 1505 he was employed with the Lombardi to erect the fine tomb of Cardinal Zeno in Saint Mark's. His last works were the three bronze warriors in the square of Saint Mark's, begun in 1505. Leopardo is considered the first sculptor of his time in Venice.

LEOPARD SEAL. The Pacific Coast variety of the 'common' or 'harbor' seal (*Phoca vitulina*), which is more often spotted than is that of the Atlantic. Consult Scammon, *Marine Mammals of the Northwestern Coast of North America* (San Francisco, 1874). See SEAL.

LEOPARD (or CAT) SHARK. A small shark (*Triakis semifasciatum*) of Southern California, gray, banded and spotted with black. It is a handsome fish, and may be quickly recognized by its variegation.

LEOPARD-TREE. A tree which furnishes a useful gum. See FLINDERSIA.

LE'OPOLD I. (1640-1705). Holy Roman Emperor from 1658 to 1705. He was the second son of Ferdinand III. (q.v.) and Maria Anna of Spain, and was born in Vienna, June 9, 1640. He was educated for the Church, but on the death of his father in April, 1657, his elder brother having died in 1654, he succeeded as ruler of the hereditary Austrian dominions (including Bohemia) and as King of Hungary, a large part of which country was still in the hands of the Turks. He was elected Emperor July 18, 1658, and crowned at Frankfort August 1st. The internal affairs of his reign are unimportant. In external relations it was a troubled half-century for Austria, and Leopold showed himself unequal to dealing with the complications and dangers surrounding his State. The chronic struggle with the Turks was renewed in 1660, and Hungary and even Austria were seriously imperiled, but Montecuculi signally defeated the enemy at Saint Gotthard on the Raab, August 1, 1664. Leopold thereupon hastened to make a truce with the Sultan. The persecution of the Protestants in Hungary, inspired by Leopold's intolerant zeal, and his utter disregard of the Hungarian liberties, led in 1678 to a formidable revolt in that kingdom under Count Tökölyi (q.v.). The Hungarians were supported by the Sultan, and in 1683 a vast Turkish army, under the Grand Vizier, Kara Mustapha, advanced to Vienna, which was besieged from July 14th to September 12th, and was saved only by the timely assistance of John Sobieski (q.v.), the warrior King of Poland, who, seconded by Charles of Lorraine and the electors of Saxony and Bavaria, completely routed the besieging forces and drove them beyond the Raab. This signal service of the Polish King Leopold repaid with ingratitude. In 1686 Buda was recovered from the Turks. Hungary was now mercilessly punished, and a Diet in 1687 was compelled to register the will of Leopold, making the crown hereditary in the House of Hapsburg. The expulsion of the Turks from Hungary and Transylvania was completed (1690-99) by the brilliant campaigns of Prince Eugene, and in the Treaty of Carlowitz the Turks were forced to give up Hungary between the Danube and Theiss, and to allow Leopold to take Transylvania. Leopold, however, did not succeed in attaining full possession of Hungary, which obstinately resisted his drastic policy, and the task went over to his successor, Joseph I. (q.v.). The natural rivalry between the House of Hapsburg and that of France involved Leopold in the European wars against Louis XIV. from 1672 onward, and at his death he handed this struggle over as a legacy to his son. He joined the League of Augsburg against France in 1686 and the Grand Alliance in 1689, his allies being Sweden, Spain, Holland, Savoy, Bavaria, Saxony, and the Palatinate. The Imperial armies were brilliantly led by Prince Eugene. The Peace of Ryswick, in 1697, brought to a close one period of this great struggle; but the year 1701 witnessed the outbreak of the War of the Spanish Succession, which was still in progress when Leopold died in Vienna, May 5, 1705. Consult: Scheichl, *Leopold I. und die österreichische Politik während des Devolutionskrieges* (Leipzig, 1888); Baumstark, *Kaiser Leopold I.* (Freiburg im Breisgau, 1873). See AUSTRIA-HUNGARY.

LEOPOLD II. (1747-92). Holy Roman Emperor from 1790 to 1792. He was the third son of Emperor Francis I. and Maria Theresa of Austria, and was born in Vienna, May 5, 1747. In 1765, on the death of his father, he became Grand Duke of Tuscany, and ruled as one of the numerous class of despotic but enlightened rulers of the eighteenth century. He abolished the Inquisition, abrogated the death penalty, equalized the land tax, favored free trade, and founded schools and almshouses. In 1790, on the death of his brother, Joseph II., who left no children, he became Emperor and ruler of the Austrian dominions. He found the affairs of his hereditary States in the utmost confusion, owing to the drastic reform policy of Joseph II. (q.v.). As King of Hungary he bound himself to act strictly in accordance with constitutional law. He restored order in Belgium, which had risen in insurrection under his predecessor. Leopold's attitude to the French Revolution in its early phases was marked by extreme moderation in spite of the efforts of the émigrés within the Empire to bring on war with France. Neither did he seem to appreciate the danger that threatened his sister, Marie Antoinette, and Louis XVI., her husband. After the attempted flight of the royal family from France, however, he entered into an agreement with the King of Prussia at Pillnitz (July, 1791), guaranteeing the integrity of their respective States, and expressing their determination, in connection with the other Powers, to reestablish order in France, but forbidding at the same time any preparation for armed invasion of France on the part of the émigrés. Only when the war party in the French National Assembly had attained the upper hand did Leopold give up all hope of preserving peace with France. On February 7, 1792, he concluded an alliance with the King of Prussia, but died March 1, 1792, before the actual declaration of war by France. In 1791 peace was arranged with Turkey at Sistova. His wife was Maria Louisa, daughter of Charles III. of Spain. His eldest son, Francis, was the last of the Holy Roman Emperors. Consult: Sybel, *Kaiser Leopold II.* (Munich, 1869); Wolf, *Leopold II. und Maria Christina* (Vienna, 1867); and Beer, *Joseph II. und Kaunitz* (Vienna, 1873).

LEOPOLD I., Prince of Anhalt-Dessau. See ANHALT-DESSAU.

LEOPOLD I., GEORGE CHRISTIAN FREDERICK (1790-1865). King of the Belgians from 1831 to 1865. He was the son of Francis, Duke of Saxe-Coburg, and was born December 16, 1790. He received an excellent literary and scientific education, and had the reputation of being one of the most cultured princes in Europe. He became a general in the Russian army in 1805, and enjoyed high favor with the Emperor Alexander I. He was present at the battles of Lützen, Bautzen, and Leipzig, and took part in the invasion of France in 1814. He visited England after the Peace of 1815, and in the following year was betrothed to the Princess Charlotte, the heiress of the throne. He was naturalized by act of Parliament, and received an annual pension of £50,000. The marriage took place on May 2, 1816; but the Princess died in child-bed November 5, 1817, and the child did not survive. Prince Leopold now lived in complete retirement in London, and at his seat of Claremont. He received in February, 1830, the offer of the crown of Greece, and at first favorably entertained the proposal, but afterwards rejected it, finding that it would not be granted to him by the Powers under conditions just or satisfactory to the Greeks. On June 4, 1831, he was elected by a national congress King of the Belgians, the people having risen against the rule of Holland, and on July 21 of that year his coronation took place at Brussels. In 1832 he married Princess Louise, daughter of Louis Philippe, King of the French, who died in 1850. As a monarch, Leopold conducted himself with great prudence, firmness, and moderation, and with constant regard to the principles of the Belgian Constitution. He died December 10, 1865, and was succeeded by his son, Léopold II. His daughter, Carlotta, was the wife of Maximilian, Emperor of Mexico. Consult: Juste, *Les fondateurs de la monarchie belge, Léopold Ier, roi des Belges* (Brussels, 1868), trans. into English as *Memoirs of Leopold I.* (London, 1868); also a monograph, *L'élection de Léopold Ier* (Brussels, 1892); Taillandier, *Le roi Léopold et la reine Victoria* (Paris, 1878).

LEOPOLD II. (1835—), LOUIS PHILIPPE MARIE VICTOR. King of the Belgians since 1865. He was born April 9, 1835, the eldest son of King Leopold I. He married, in 1853, Marie Henriette, a daughter of the Archduke Joseph of Austria, and ascended the throne on the death of his father, December 10, 1865. In 1876 he effected at Brussels the organization of the African International Association (q.v.) with a view to making use of the recent discoveries in Africa. A shrewd and enterprising man of business, he promoted this work with great energy, furnishing the means, largely from his own resources, for Stanley's exploration of the Congo. The Congo Free State (q.v.) was established and neutralized and the sovereignty of it was given to Leopold by the Berlin Conference in 1885. (See BELGIUM.) His only son, Prince Leopold, Duke of Brabant and Count of Hainault, died in 1869. Of his three daughters, the eldest, Louise, born in 1858, was married to Prince Leopold of Saxe-Coburg, and the second daughter, Stéphanie, born in 1864, became the wife of the Crown Prince Rudolph of Austria-Hungary, who died in 1889. Queen Marie Henriette died September 19, 1902.

LEOPOLD II. (1797-1870). Grand Duke of Tuscany, a son of the Grand Duke Ferdinand III., with whom he returned from exile in 1815, and whom he succeeded in 1824. His rule was efficient and mild, and he met the revolutionary movements of 1848 by granting a constitution. He lent at first a half-hearted aid to Charles Albert of Sardinia in the war against Austria, but, unable to cope with the situation, he fled from his dominions in February, 1849, and withdrew to Naples. He returned in a few months and resumed his sway, which soon became despotic and was upheld by Austrian troops. In 1859 he refused to enter an alliance with Sardinia, and this led to his overthrow. He fled to Vienna, abdicating in favor of his son, but Tuscany, by a plebiscite, was incorporated into the Kingdom of Italy. He died an exile in Bohemia, January 29, 1870.

LEOPOLD II., LAKE. A large lake in the administrative district of the same name in the western part of Congo Free State (Map: Africa, F 5). It is 105 miles long from north to south, and its greatest width is 40 miles; its shores are very irregular. Its water is for the most part shallow, and it is drained by the Mfini, which flows from its southern end westward into the Kassai, through which it enters the lower Congo. The lake was discovered by Stanley in 1881.

LEOPOLD, ORDER OF. (1) An Austrian order of civil and military merit, instituted in 1808 by the Emperor Francis I. in memory of his father, Leopold II. It has three classes. The decoration is a cross of red enamel with white border, bearing in the centre the letters F. I. A. (Franciscus Imperator Austriæ), surrounded by the words Integritati et Merito (for uprightness and merit). On the reverse is the legend 'Opes regum corda subditorum' (the riches of kings are the hearts of their subjects). The Emperor is grand master. (2) A Belgian civil and military order, founded by Leopold I. in 1832, with five classes. The decoration is a white enameled cross with a wreath of oak and laurel, bearing the letters LL. and RR. (Leopoldus Rex). On the reverse are the Belgian arms and the device of the order, 'L'union fait la force' (in union is strength). See Plate of ORDERS.

LEOPOLD, GEORGE DUNCAN ALBERT, Duke of Albany (1853-84). The youngest son of Queen Victoria. He was educated by private tutors and at Oxford, and traveled extensively. In 1878 he began to take part, so far as his delicate health and the formalities of his station would permit, in social, educational, and literary affairs. He manifested a decided taste for intellectual pursuits. In 1882 he was married to Princess Helena of Waldeck-Pyrmont. He died in the south of France, where he had gone for the benefit of his health.

LEOPOLD, lā′ō-pōlt, KARL GUSTAF AF (1756-1829). The Swedish Gottsched (q.v.), bulwark of French Classicism against the attacks of the

Romantic Phosphorists. He attempted all forms of poetry save the epic, and approached nearest to distinction in his tragedies *Odin* (1790) and *Virginia* (1802).

LEOPOLD CHARLES FREDERICK (1790-1852). Grand Duke of Baden. He succeeded his half-brother, Louis, in 1830. He interested himself in the liberal ideas of his time, granted concessions to his subjects in 1848, and in the spring of 1849 declined to oppose the movement which finally broke down all barriers and forced him to flee from the country on the night of May 13th. In August he was reinstated by the troops of Prussia and the Confederation. He acted with the greatest forbearance after regaining his power. During the last years of his reign he admitted his son Frederick, who later succeeded him, to a share in the government.

LEOPOLDVILLE, lē'ō-pōld-vĭl. An important station in the Congo Free State, West Africa, situated on the left shore of Stanley Pool, in latitude 4° 20′ S., about 250 miles by rail from Matadi. It is important as the eastern terminal of the Matadi-Leopoldville Railway line and the western terminus of navigation on the Upper Congo. The adjacent settlement of Kinchassa is the port of Leopoldville.

LEOSTHENES, lē-ŏs'thē-nēz (Lat., from Gk. Λεωσθένης). A distinguished Athenian general. When, after the death of Alexander the Great in B.C. 323, a league was formed, having as its object the expulsion of the Macedonians from Greece, Leosthenes was put in command of the confederate army. He first repulsed the Bœotians, who were fighting on the side of the Macedonians, and then defeated Antipater, the Macedonian general, near Thermopylæ. The latter took refuge in Lamia in Thessaly, which Leosthenes immediately proceeded to besiege. He was killed by a stone thrown from the ramparts, B.C. 322. The Athenians honored him with a public funeral, and Hyperides delivered the funeral oration.

LEOTYCHIDES, lē'ō-tĭk'ĭ-dēz (Lat., from Gk. Λεωτυχίδης) (?-c.469 B.C.). King of Sparta (B.C. 491-469). With the aid of Cleomenes he brought about the deposition of his kinsman, King Demaratus, whom he succeeded. He commanded the Greek fleet in B.C. 479, and shared with Xanthippus the honor of the victory over the Persians at Mycale. Afterwards he was sent into Thessaly, to punish those who had sided with the Persians, but on his return home was convicted of having accepted bribes from the Aleuadæ, who had once more become masters of Thessaly. He was accordingly banished to Tegea, where he died.

LEOV'IGILD. King of the Visigoths from 569 to 586. He was noted as a successful warrior and founder of cities. He did much to civilize his Gothic subjects and to fuse them with the Roman population of Spain into a single people. He is remembered, however, rather for his family troubles than for his real greatness. His son Ermenegild married a Catholic princess and by her influence was converted from the Arian faith, which his father held. As the head of the Catholic party he engaged in repeated revolts against his father, who finally ordered his execution. After the son's death Leovigild banished some Catholic bishops, but did not put any to death. In legend he has been depicted as a persecutor of the Catholic faith and his son as a martyred saint. Consult Bradley, *The Goths* (New York, 1888).

LEPANTO, lȧ-păn'tō, Battle of. A naval engagement fought October 7, 1571, near the Curzolari Islands, at the western entrance to the Gulf of Patras, between the combined fleets of Venice, Spain, and the Papal States, and a powerful Turkish armada. The determination of Sultan Selim II. to wrest Cyprus from Venice was the occasion of the attack by the States united in the Holy League. The allied fleet, consisting of nearly 300 sail, of which about 200 were great galleys, was commanded by Don John of Austria (q.v.); the Ottoman fleet, under Ali Pasha, was of about equal numerical strength. The engagement was a desperate and sanguinary one, resulting in a victory for the Christian fleet. About 3000 Christians were killed, while the Turks are believed to have lost as many as 30,000 in killed, wounded, and prisoners. More than a hundred galleys were taken, besides a large number sunk. Twelve thousand Christian galley slaves were liberated by this victory, which nevertheless failed of its chief object, in that before battle was joined news came of the successful invasion of Cyprus by the Turks. The battle of Lepanto, however, effectually broke the Turkish naval power in the Mediterranean. The Christian fleet having been stationed, previous to the attack, at the mouth of the Acheloüs River in the neighborhood of the Curzolari Islands, the name of the latter has been given to the battle by some writers. Consult: Prescott, *History of Philip II.;* Stirling Maxwell, *Don John of Austria* (London, 1883).

LEPANTO, Gulf of. See Corinth, Gulf of.

LEPCHAS, lĕp'chaz. A Tibetan stock of Sikkim, Bhutan, and part of Eastern Tibet. They are a small but powerful and muscular people, without that repulsive aspect met with in so many Tibetans. Their two principal divisions are the Rông and the Khamba. They are for the most part Buddhists. The language of the Lepchas proper or Rông is an archaic form of Tibetan. Mainwaring, whose *Grammar of the Róng (Lepcha) Language in the Darjiling and Sikkim Hills* was published at Calcutta in 1876, entertained the extravagant opinion that this form of speech was "probably the oldest language extant." An essay, *Ueber die Sprache des Volkes Róng in Sikkim*, by Schoot, was published by the Berlin Academy in 1882. On the Lepchas, consult the following works: Von Schlagintweit, *Results of a Scientific Mission to India and High Asia* (London, 1863); Rowney, *Wild Tribes of India* (London, 1882); Donaldson, *In Lepcha Land* (London, 1900).

LEPERDITIA, lĕ'pĕr-dĭsh'ĭ-ȧ. A common fossil ostracod (q.v.) found in rocks of Ordovician to Carboniferous age. Its shells are oblong, one-tenth to three-fourths of an inch long, with straight dorsal edge, smoothly rounded surface, and a small eye-tubercle. These shells are abundant at some horizons, especially in the lower Trenton limestones of the Lake Champlain Valley, and in the Upper Silurian water limestones of New York, Pennsylvania, and Ohio, and in limestones of similar age in Europe. In these rocks they often occur packed together in myriads. See Crustacea.

LEP'IDODEN'DRON (Neo-Lat., from Gk. *λεπίς*, *lepis*, scale + *δένδρον*, *dendron*, tree). An important genus of extinct tree-like club-mosses, the remains of which are abundant in rocks of Carboniferous age in many parts of the world. These plants, some of which grew to trees 75 to 100 feet in height, were gigantic ancestors of the modern club-mosses (Lycopodium), with which they have many points of resemblance. They grew in abundance in the swampy forests of Carboniferous coal-measure time, and their trunks, stems, leaves, and cones contributed largely to the vegetable mass which has been hardened into coal. They were stout trees with high woody trunks and central pith, and slender branches that bore closely set strap-shaped or awl-shaped leaves, and at the ends of the branches were borne large cone-like fructifications (Lepidostrobus) comparable to those of the club-mosses, but much larger. Their well-known roots have been called Stigmaria, which name is also applied to the roots of other Carboniferous plants. Lepidodendrons may be recognized by the form and arrangement of the scars left on the trunks and stems by the fallen leaves. These scars are rhomboidal or diamond-shaped in outline and are arranged diagonally to the axis of the stem. In this respect they differ from the scars of Sigillaria, which is often found associated with Lepidodendron, and which have a longitudinal arrangement parallel to the axis of the branch. Lepidodendron appears first in the Lower Devonian rocks, was very abundant in the coal-measures of Carboniferous time, and became extinct in the Permian period. Several allied genera—Ulodendron, a tree-trunk from the Devonian; Lepidophloios, Lomatophloios; and Knorria, represented by decorticated stems in Permian rocks—are grouped together in the family Lepidodendridæ, which is eminently characteristic of Upper Paleozoic formations.

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LEPID'OLITE (from Gk. *λεπίς*, *lepis*, scale + *λίθος*, *lithos*, stone). A mineral of the mica group, having a well-marked basal cleavage, pearly lustre, and varying in color from deep red to yellow or gray. It resembles muscovite in chemical structure, but its alkali base is lithium instead of potassium. The amount of lithium present is about 5 per cent. Lepidolite occurs in granite and gneiss, especially in veins, where it is associated with tourmaline, cassiterite, spodumene, and muscovite. Some of the well-known localities for lepidolite are Auburn, Me.; Chesterfield, Mass.; near San Diego, Cal.; and Christiania, Norway. The deposits in California are exploited, and the mineral is sold to chemical manufacturers, who recover the lithium. See LITHIUM.

LEP'IDOM'ELANE (from Gk. *λεπίς*, *lepis*, scale + *μέλας*, *melas*, black). A variety of mica related to biotite. It is black, opaque, or translucent, has an adamantine lustre, and differs from other micas chiefly in containing a large percentage of ferric iron. It occurs near Baltimore, Md., and Litchfield, Me., and at several localities in Sweden and Finland.

LEP'IDOP'TERA (Neo-Lat., from Gk. *λεπίς*, *lepis*, scale + *πτερόν*, *pteron*, wing). An order of insects including all those forms known as 'butterflies' and 'moths' (q.v.). They possess four wings, both body and wings being covered with scales, usually variable in color, and those on the body resembling hair. The adult has mouth-parts incapable of biting and usually forming a long, coiled proboscis capable of protrusion. The metamorphosis is great and abrupt, and the pupa usually has its appendages cemented to the body. The duration of the pupa stage is longer than with other insects. The classification of the Lepidoptera is now in a condition of rapid change, authorities differing greatly in their conceptions of families.

Fossil Lepidoptera are very much rarer than any other fossil insects, and except a couple of hawk-moths from the Jurassic of Solenhofen, Bavaria, have been found only in Tertiary rocks. The small Microlepidoptera, especially the Tineidæ, are represented by many specimens from the amber, and nearly all the other important families of moths have their Tertiary ancestors. The Oligocene shales at Florissant, Colo., have furnished two most beautifully preserved specimens of butterflies (Prodryas and Barbarothea). Consult: Von Zittel and Eastman, *Text-Book of Paleontology*, vol. i. (London and New York, 1900); Scudder, *Fossil Butterflies* (Salem, 1875). See BUTTERFLIES AND MOTHS; INSECT.

LEP'IDOSI'REN (Neo-Lat., from Gk. *λεπίς*, *lepis*, scale + Neo-Lat. *Siren*, a genus of amphibians, from Lat. *siren*, Gk. *σειρήν*, *seirēn*, siren). One of the three surviving genera of lung-fishes (Dipnoi). See MUDFISH.

LEP'IDOS'TROBUS (Neo-Lat., from Gk. *λεπίς*, *lepis*, scale + *στρόβος*, *strobos*, a whirling round). The cone-like fossil fruit of Lepidodendron, found in the coal-measures of Carboniferous age. See LEPIDODENDRON.

LEP'IDO'TUS (Neo-Lat., from Gk. *λεπιδωτός*, scaly, from *λεπιδοῦν*, *lepidoun*, to make scaly, from *λεπίς*, *lepis*, scale). An extinct genus of actinopterygian ganoid fishes, allied to Semionotus, remains of which are abundant in the Mesozoic deposits of Europe, India, and Brazil. See SEMIONOTUS.

LEP'IDUS. The cognomen of an illustrious Roman family of the Æmilia gens. The Lepidi played an important part in the history of Rome, from Marcus Æmilius Lepidus, consul in B.C. 285, to Manius Æmilius Lepidus, consul in A.D. 11. The chief members of the family were the following: (1) M. ÆMILIUS LEPIDUS (?-B.C. 152), who gained renown as a youth by slaying an enemy and saving a citizen's life, was one of three ambassadors sent by Rome to Egypt in B.C. 201 to govern the realm of the infant Ptolemy the Fifth, Epiphanes; and although still a young man, Lepidus became the King's guard-

utor regis). He was pontifex in 199, ædile
, prætor in Sicily in 191, and consul in 187,
he helped to conquer the Ligurians; ponti-
aximus in 180, censor in 179, and consul
in 175. His death occurred in B.C. 152.—
I. ÆMILIUS LEPIDUS, the triumvir (?-B.C.
On the outbreak of civil war between
and Pompey, Lepidus took active sides
he former, and was left in general control
airs in Rome during Cæsar's absence (B.C.
. He then was sent to Spain as proconsul,
njoyed a triumph on his return in 47.
, as dictator, made him his *magister equi-*
n this year, and again in 45 and 44, and he
e consul with Cæsar in 46. In the fatal
44 Cæsar made him Governor of Gallia
nensis; but before he had completed his
ations to leave Rome the great Dictator
ssassinated. Lepidus, however, could at
ely on the army which he had been drill-
nd with its help he was of great assist-
o Antonius in his opposition to the aristo-
faction. He was made pontifex maximus,
oon left with his army for his province.
his military strength led both parties in
to struggle for his support by heaping
s upon him; but though he dallied with
his real sentiments were with Antonius,
oon joined him in Gaul and formed a sort
lition. Octavius in Rome also put himself
respondence with them, and the Senate was
ithout a powerful friend. In the confer-
hat took place at Bononia (Bologna) in
r, B.C. 43, the second triumvirate was
d. Antonius and Octavius set out for the
while Lepidus remained in Italy. From
n he played only a subordinate part in the
affairs of the Republic, and was even de-
of his province by his colleagues. He
onsul, however, in B.C. 42, and Governor
rica from 40 to 36. In 37 the triumvirate
enewed, with Lepidus still as a member,
h little consulted in the questions of the
This proved too galling for even Lepidus,
e made an attempt to gain control of Sicily
is army. Though Lepidus was at first suc-
l, Octavius was soon able to alienate his
, and the former was literally brought to
ees before the young conqueror (B.C. 36).
s dropped from the triumvirate, deprived
army, and compelled to live in retirement.

PINE, lȧ'pēn', ERNEST LOUIS VICTOR
(1826-93). A French author, born in
He studied painting and music; entered
overnment service, and became secretary to
uke de Morny. He was referendary in the
of Accounts from 1865 until he died. He
for the *Constitutionnel* and the *Vie Pari-*
, among various journals. He collaborated
Alphonse Daudet in *La dernière idole*
); *L'œillet blanc* (1865); and *Le frère*
1867). Besides these plays, which were the
successful of his writings, his books in-
La légende de Croque-mitaine (1863); *La*
sse éblouissante (1869); *Double face*
); and *Un an de règne* (1891).

PLAY, le plȧ, PIERRE GUILLAUME FRÉ-
(1806-82). A French mining engineer,
nist, and sociologist, born at La Rivière
Sauveur (Calvados). He studied at the
Polytechnique, was appointed to the De-
ent of Mines, became director of the labo-
of the Ecole des Mines and co-editor of
the *Annales des Mines* in 1832, and in 1834 published the results of a geological and statistical investigation of the mineral resources of Spain made for the Spanish Government. He was subsequently placed in charge of the Commission of Mining Statistics, then newly established, and received the appointments of professor of metallurgy at the École des Mines (1840), inspector of mines (1848), and honorary inspector-general (1868). He was prominently connected with the various world fairs. In 1881 he began the publication of the fortnightly periodical, *La Réforme Sociale*, which serves as the joint organ of the society and the unions. He was for several years Senator of the Empire, but after 1870 withdrew from public life. In France he is considered the founder of social economy. He followed the inductive method, and applied to social studies the process of scientific observation of phenomena employed in the natural sciences. He is opposed at once to socialism and to *laissez-faire*, and in such writings as *La réforme sociale en France* (1864) and *L'organisation du travail* (1870; in an English translation by G. Emerson, Philadelphia, 1872) urges the necessity to the stability of the social order of sympathy on the part of employer toward employed, which should count among its principal objects a thorough agreement upon the amount and method of payment of wages, and ready means for the investment of savings. His publications further include *Les ouvriers européens* (1855). Consult the article by Higgs in volume iv. of the *Quarterly Journal of Economics* (Boston, 1890).

LEPORELLO, lā'pô-rĕl'lô. In Mozart's opera *Don Giovanni*, the cowardly valet and tool of the title character.

LEPORIDE, lĕp'ô-rīd (from Lat. *lepus*, hare). A variety of European hare, now known in the United States as the Belgian hare (q.v. under RABBIT), which was formerly so named because wrongly believed to be a remarkably prolific hybrid between the common European hare and the rabbit. It is extensively bred in France and Belgium, where it is highly esteemed for food.

LEP'RA (Lat., from Gk. λέπρα, from λεπρός, *lepros*, scaly, from λεπίς, *lepis*, scale). A diseased condition of plants during which their leaves are covered with scales. The term was formerly applied also to cutaneous diseases that were accompanied by scaling of the skin. Willan and his followers use the term for psoriasis (q.v.), which is also called *lepra alphos*. Finally, the term has been applied to leprosy; this usage, however, is only an example of the confusion in the older terminology of skin diseases. See LEPROSY.

LEPRACHAUN, lĕp'rȧ-kạn, or **LUPRACHAUN**, lŭp- (Ir. *luchorpan*, *lucharban*, pygmy sprite, little body, from *lu*, little, *corpan*, diminutive of *corp*, body, from Lat. *corpus*, body). A familiar pygmy sprite peculiar to Irish superstition. Sometimes the Leprachaun takes up his habitation in the farmhouse itself, and will make himself invaluable by rendering various household services. The Leprachaun is described as a mannikin less than two feet in height, attired in cocked hat, laced coat, knee-breeches, and shoes with silver buckles. He is wont to infest wine-cellars, but his chosen occupation seems to be that of maker of brogans. The presence of the elf in some sequestered dell is frequently betrayed by the noise of his hammering. In such a case the human intruder must fix his gaze upon him and induce him, if possible, by threats, to reveal the hiding-place of his reputed treasure. If, however, the Leprachaun can divert the eye of his captor momentarily, he is able to vanish. The Leprachaun is the Celtic congener of the German *Kobold* and the Latin *Incubo.*

LEPROSY (OF. *leprosie,* from ML. *leprosia,* from MGk. *λέπρωσις, leprōsis,* leprosy, from Gk. *λεπροῦσθαι, leprousthai,* to become leprous, from *λέπρα, lepra,* leprosy). A constitutional disease of chronic character, endemic in certain localities, contagious through intercourse with an infected person, and due to the presence of the *Bacillus lepræ* (Hansen); being characterized by the formation of nodular infiltrations and other nutritional changes in the skin and by an eruption. It is also called *Lepra, Elephantiasis Græcorum, Satyriasis, Leontiasis,* as well as *Zaraath* in Hebrew, and *Uchetie* in Egyptian. Egypt is called the cradle of leprosy, and it certainly existed in that country from a very remote period. On papyri found in the tombs of kings, descriptions of it are given. The Papyrus Ebers, transcribed in the fifteenth century B.C., describes and prescribes for it. Assyrian and Babylonian hieroglyphics relate to the disease. It has existed in India at least 3000 years. Leprosy was described by a writer of 2000 years ago in China. Greece had seen the disease before Hippocrates wrote of it. It was probably taken to Arabia before the time of Mohammed. It was common among the Jews in B.C. 260. Aretæus, A.D. 81, found it spreading over Western Europe. The Romans contracted it from the Greeks; the troops of Pompey carried it into Italy in the first century B.C. Pilgrims from the Holy Land introduced the disease into England (Simpson). Wales, Ireland, Norway, Sweden, and other parts of Europe became infected. The invasion of America by the disease cannot be traced.

Segregation of lepers was practiced at a very early date. According to Herodotus, the Persians exiled lepers in his day. Moses, following Egyptian customs, segregated lepers among the Jews. Canthie is authority for the statement that the Chinese burned lepers alive. In the Middle Ages leproseries were established in France under chaplains, and the lepers were uniformly garbed and provided with a rattle, with which to warn others of their approach. In the time of Louis VIII. there were 2000 leper-houses in France, while the number in Europe, excluding those in Russia and Sweden, was 19,000 (Marrow). In the British Isles isolation was enforced, lodgings in leper-houses, cowls, gray habits, sticks, and clappers being furnished to the unfortunates. In modern times strict segregation is practiced in almost all localities where lepers are found. In the United States, Louisiana alone has built a special lazaretto for lepers, in which about 75 were segregated in 1902.

The annexation of the Hawaiian Islands by the United States brought the Government face to face with the problem of caring for the lepers. A commission was ordered in January, 1898, consisting of certain physicians in the Marine Hospital Service, to ascertain the facts regarding leprosy and enumerate the lepers in the country. Their task had not been begun when the Spanish-American War broke out. In November, 1898, Dr. D. A. Carmichael, of the United States Marine Hospital Service, made an extended report on leprosy in the Hawaiian Islands. There were then in the leper settlement on Molokai 634 leper males, 439 leper females—total, 1073, including 141 boys and 130 girls. Also of non-leprous children of leprous parents, 43 male and 18 female—total, 61. Also helpers (Kokuas), non-leprous persons living in the settlement and caring for relatives, 37 males and 36 females—total, 73. Also non-leprous priests, sisters, brothers, teachers, etc., 61. Grand total, 1207. In 1901 a systematic search for lepers was made in the islands, and all suspected cases were thoroughly examined, all lepers being sent to the colony. The new cases in 1900 were but 85 in number, as compared with 132 in 1890. At the Molokai settlement at the close of 1901 there were 909 lepers and 164 clean persons, who are maintained, fed, housed and clothed, and governed at an annual expense of $80,000. Under the new rules, visitors are not allowed to embrace, kiss, or touch the lepers, as formerly, while they are allowed to visit them at any time, separated by a double wire fence. (See HAWAIIAN ISLANDS.) Leprosy is said to be prevalent in Brittany and Savoy to-day. Russian authorities report the scourge present in Livonia and Smolensk. The United States consul reports the existence of 200 lepers on the island of Teneriffe, Canary Islands. Germany, Russia, and Rumania, in 1891, mutually agreed to give no passports to lepers. At least 30 lepers are known to exist, in Canadian cities, while the United States Marine Hospital commission has found 900 in this country.

The bacillus of leprosy was discovered by Hansen (q.v.), of Bergen, Norway, in 1871. Neisser, in 1879, after extended researches, confirmed Hansen's claims. The bacillus is a straight or slightly curved thin rod, non-motile, occurring singly or in pairs attached end to end, but not in chains. When stained, it appears like the bacillus of tuberculosis, but often takes stain in such a way as to suggest that the protoplasm is fragmented, the bacilli then appearing like cocci in short rows, darkly stained points alternating with unstained points. The bacilli appear in very large numbers in the leprous tissue, especially in the tubercular form, lying in bundles of several bacilli arranged parallel to each other, the bundles lying in various directions. Under the influence of the bacillus, nodules of new tissue are formed in the skin or subcutaneous tissue. These nodules resemble granulation tissue, being made up of a fibrous stroma, in which are cells of various shapes. Bacilli are present in the tissue in large numbers, both in and between the cells. The nodules are most common in the exposed parts of the skin, face, hands, etc., but may occur in any part of the skin. The mucous membrane of the eyes, nose, and mouth may be affected. More rarely nodules develop in deeper parts of the body. The nodules may be large or small. There may be extensive ulceration with later cicatrization, sometimes producing in the face the so-called 'facies leontina.' Deep ulcers affecting the fingers or toes may result in extensive loss of substance, 'lepra mutilans.' In the form of leprosy known as anæsthetic leprosy the lesion seems to be a peripheral neuritis, due to the presence of the bacilli in the nerves.

Some authorities mention three forms of leprosy: the *macular*, characterized by dark red or black stains; the *anæsthetic*, characterized by loss of sensation in patches of the integument and flesh; and the *tubercular*, characterized by nodules of tubercular granulation tissue, or a diffuse infiltration in skin and mucous tissue. Some cases unite all three varieties. In the macular-anæsthetic type the chief changes are in the nerves, leading to destruction of nerve-fibres with consequent anæsthesia, paralysis of muscles, and trophic disturbances. The period of incubation of leprosy is from three to seven or ten years, the patches first appearing on the unexposed parts of the body, with ulcers on the upper part of the nasal passages, thus rendering detection difficult. Heredity of leprosy is considered a mistake. Consult: Morrow, "Leprosy," in *Atlas of Skin and Venereal Diseases* (New York, 1890); Ashmead, *Suppression and Prevention of Leprosy* (Norristown, Pa., 1897). See HANSEN.

LEPSIUS, lĕp′sê-ụs, KARL RICHARD (1810-84.) A German archæologist and Egyptologist, born at Naumburg, December 23, 1810. He studied at Leipzig, Göttingen, Berlin, and Paris. His first work, *Die Paläographie als Mittel der Sprachforschung* (1834), received the Volney Prize of the French Institute. For some years after this he wrote chiefly on paleography, on the Etruscan, Oscan, and Umbrian inscriptions (*Inscriptiones Umbricæ et Oscæ*, 1841), and on comparative philology (*Zwei sprachvergleichende Abhandlungen*, 1836, etc.). With his *Lettre à M. le professeur H. Rosellini sur l'alphabet hiéroglyphique* (1837), written while he was living at Rome (where he became intimately acquainted with Bunsen), he entered the field of hieroglyphic research. In 1842 he was placed at the head of an expedition sent to Egypt by the King of Prussia and spent three years (1842-45) in exploring the ruins of Egypt and Nubia as far as Khartum. The results of this expedition were given to the world in the magnificent work, *Denkmäler aus Aegypten und Aethiopien* (1850-59), published at the expense of the King, and in his *Briefe aus Aegypten* (1852). He became professor of Egyptology at Berlin in 1846, director of the Berlin Egyptian Museum in 1865, and director of the Royal Library in 1873. Of his numerous works the following are the most important: *Chronologie der Aegypter* (1840); *Todtenbuch der Aegypter* (1842); *Das bilingue Decret von Kanopus* (1866). He also wrote on metrology, *Die Längenmasse der Alten* (1884), and on phonetics, *Standard Alphabet for Reducing Unwritten Languages*, etc. (1863). His *Nubische Grammatik* (1880) touched on comparative African philology. He died July 10, 1884. Consult Ebers, *Richard Lepsius, ein Lebensbild* (Leipzig, 1885).

LEPTÆ′NA (Neo-Lat., from Gk. λεπτός, *leptos*, slender). A fossil brachiopod genus characteristic of the middle Paleozoic rocks throughout the world. The shells are of deltoid outline, with concentric folds and fine radiating lines. All the varieties, ranging from the upper Ordovician into the lower Carboniferous rocks, are probably only modifications of a single race typified by the species Leptæna rhomboidalis, which has undergone adaptive changes caused by the climatic and physical conditions during the various geological epochs in which it lived.

LEPTANDRA (Neo-Lat., from Gk. λεπτός, *leptos*, slender + ἀνήρ, *anĕr*, male; in modern botanical terminology, stamen). A generic name proposed by Nuttall for Veronica virginica, Culver's root, or Culver's physic, and now employed as the pharmaceutical name of that plant. In America it grows in rich woods from Vermont and Wisconsin southward, and is often cultivated for ornament. It blossoms in July and August. See Plate of BLOODROOT, ETC., accompanying article SANGUINARIA.

LEPTOCARDII, lĕp′tô-kär′dĭ-ī (Neo-Lat. nom. pl., from Gk. λεπτός, *leptos*, slender + καρδία, *kardia*, heart). A class of small fish-like animals belonging to the phylum Chordata. It includes two genera, Amphioxus and Asymmetron. The leptocardians are commonly classed with the vertebrates, although they possess no true backbone, and as such they form the Acrania in distinction to all the remaining vertebrates—the Craniata. (See CLASSIFICATION OF ANIMALS.) Because of this primitive organization and consequent low position among chordates, they form a most important group for the naturalist, and their anatomy and development have been extensively studied. See AMPHIOXUS.

LEPTODISCUS. See NOCTILUCA.

LEP′TOME (from Gk. λεπτός, *leptos*, slender). The conducting portion of the phloëm of a vascular bundle. It includes the sieve-tubes, companion cells, cambium, and bast-parenchyma, but not the bast-fibres. See HADROME and MESTOME.

LE PUY, le pwē. A town of France. See PUY, LE.

LE QUEUX, le kū, WILLIAM (1864—). An English novelist, born in London. He was educated there and in Italy, was an art student, then a journalist in Paris, and on his return to London was editor of *Gossip* and *Piccadilly*, and Parliamentary reporter for the *Globe* (1888). He was a sub-editor of that paper in 1891-93, traveled in the East, in 1900 went to San Marino as secretary to a British diplomatic mission, and afterwards became consul there. He produced such novels as *Guilty Bonds* (1890); *Sinned Against* (1891); *The Great War in England in 1897* (1892); *Zoraida* (1894); *The Temptress* (1895); *Devil's Dice* (1896); *A Madonna of the Music Halls* (1897); *Of Royal Blood* (1899); *In White Raiment* (1900); *Her Majesty's Minister* (1901); and *The Tickencote Treasure* (1902).

LERAY, le-râ′, FRANCIS XAVIER (1825-87). An American Catholic prelate. He was born at Châteaugiron, France; was educated at Rennes, and when eighteen years old came to the United States, and after a theological course at Baltimore in the Sulpitian College was ordained a Roman Catholic priest in 1852. He taught in Saint Mary's College, Maryland, and became its prefect. After missionary labors in the West, he worked at Jackson, Miss., during the epidemic of 1853, and at Vicksburg, Miss., in 1857-61. After the Civil War, in which he served as a Confederate chaplain, he returned to Vicksburg, rendered valuable service during the plague of 1867, and in 1873 was made Bishop of Natchitoches, La. He was appointed Archbishop of New Orleans in 1883, and died in France.

LERCHE, lĕr′ke, VINCENT STOLTENBERG (1837-92). A Norwegian painter, born at Tönsberg. He was a pupil of Gude at the Düsseldorf

Academy. In 1863 he won a traveling prize that enabled him to visit Italy. Upon his return he settled at Düsseldorf. His best works are interiors of churches or convents, in which scenes of monastic life in the Middle Ages are portrayed with humor and charm. He was also a wood-engraver, caricaturist, and author.

LERDO DE TEJADA, lâr'dô dâ tâ-hä'dâ, Miguel (1814-61). A Mexican statesman, born in Vera Cruz. In 1855 he was appointed Secretary of the Treasury in the Administration of President Comonfort, a position which enabled him to frame a law designed to diminish the importance of the clergy and of public corporations, and by the provisions of which they were prevented from owning landed property. The radical nature of this measure, which was aimed at the Conservative or reactionary party, caused his retirement in 1857. In 1859, after the accession of Juarez to the Presidency, Lerdo again became Secretary of the Treasury, and seized the opportunity to resume his attack upon the reactionaries, by carrying through a law for nationalizing the landed property of the clergy and placing the religious orders under Government inspection and control. In 1860 he became a judge of the Supreme Court. His friends made an unsuccessful attempt to elect him to the Presidency.

LERDO DE TEJADA, Sebastian (1825-89). President of Mexico. He was born at Jalapa in the Province of Vera Cruz, was educated in the Seminary of Puebla, and afterwards studied law in the City of Mexico. He was admitted to the bar in 1851, became a judge of the Supreme Court in 1855, and two years later was made Minister of Foreign Affairs. Elected to Congress in 1861, he was chosen president of that body. In 1863 he was the first Minister of Justice, and then Minister of Foreign Affairs, always allied with the Liberal Party. He was one of the most prominent leaders in opposition to the French intervention in Mexico, served the Provisional Government of Juarez faithfully while he was a fugitive and exile, and preserved a consistent attitude of antagonism to the Emperor Maximilian, whose death may be charged justly to Lerdo de Tejada and Juarez. On the return of the Republican Government to the capital in 1867, after the withdrawal of the French, Juarez was reëlected President, and Lerdo became Chief Justice of the Supreme Court with a seat in the Cabinet, and on the death of Juarez, in 1872, he succeeded him as President by virtue of his office. In October of that year he was elected President for four years. His administration was marked by considerable progress in economic and constitutional development, and the country enjoyed a comparatively long period of peace. In 1875, however, the elements opposed to a strong central government made common cause with the clerical reactionists, and a revolution broke out in several Mexican States simultaneously. In the Presidential election of 1876 Lerdo was a candidate for reëlection and was opposed by Gen. Porfirio Diaz; Lerdo was declared successful, but his opponents asserted that official influence had been brought to bear on the voters, and that the election was fraudulent. Diaz at the head of an army marched against the capital, and on November 26, 1876, President Lerdo escaped to Acapulco. He went to the United States early in 1877, and subsequently resided in New York, where he died.

LERICI, lā'rê-chē. A city in the Province of Genoa, Italy, four miles southwest of Sarzana, which is 65 miles by rail southeast of Genoa (Map: Italy, D 3). It has a small harbor, and an ancient castle, and in the Middle Ages was the principal city on the Gulf of Spezia. On the bay of Pertusola are silver and lead works. Population (commune), in 1881, 6071; in 1901, 9026.

LÉRIDA, lā'rê-dâ. The capital of the Spanish province of the same name, situated on the river Segre, a tributary of the Ebro, about 80 miles west of Barcelona, and on the railroad between that city and Saragossa (Map: Spain, F 2). It is built partly on a plain and partly on an eminence on the top of which stands an ancient castle. The town, which is important in a military point of view, is surrounded by walls and a moat and commanded by the citadel. It is a gloomy labyrinth of narrow and crooked streets, but contains a number of interesting old buildings, the most prominent being an old cathedral built in the thirteenth century in a strange mixture of Byzantine, Gothic, and Moorish architecture and now used as barracks; the Church of San Juan, an interesting Byzantine monument of the twelfth century; several old convents, and a palace of the kings of Aragon. The town has a bishop's palace, a new cathedral in Corinthian style, a normal school, a theological seminary, and several academies, literary and scientific societies. Lérida has manufactures of wool, cotton, silk, leather, and glass. Population, in 1887, 21,885; in 1900, 21,352. Lérida is the Celtiberian *Ilerda*, noted for its heroic resistance to the Romans. It became an episcopal see in the sixth century, and a council was held there in 564.

LÉRINS, lâ'răn', Iles de. A group of small islands in the Mediterranean, off the southern coast of France, and less than two miles from the mainland, forming a part of the Department of Alpes-Maritimes. It consists of the two small islands of Sainte-Marguerite (four miles in circumference) and Saint-Honorat (two miles in circumference), and a number of islets. They were settled at a very early period, and played a prominent part in the monastic life of France. Sainte-Marguerite has a fort, in which were imprisoned the Man in the Iron Mask and Marshal Bazaine. Saint-Honorat has the ruins of an old monastery believed to have been founded by Saint-Honorat in the fourth century, and now inhabited only by a few monks. Both islands suffered greatly from the attacks of pirates.

LERMA, lâr'mâ, Francisco de Sandoval y Rojas, Duke of (c.1555-1625). A Spanish statesman. He gained an ascendency over Philip III. when the latter was Infante, and after his accession to the throne in 1598 became his Prime Minister. with the title of Duke of Lerma. He practically ruled Spain until 1618. The peace with England in 1604, and the truce with the Low Countries in 1609, are patent examples of the failure of his foreign policy, while the brutal persecution and expulsion of the Moriscos in 1609 was a blow from which Spain never recovered. Lerma received the cardinal's hat in 1618. The unpopular Minister was forced to restore a large part of the ill-won perquisites of his administration when Philip IV. succeeded to the throne in 1621.

LERMINA, lâr'mē'nä', Jules Hippolyte (1839—). A French journalist and novelist, born in Paris. He worked on several papers and finally became editor-in-chief of *Le Soleil*. In the *Corsaire* he vigorously attacked the Empire; he was arrested in 1867 for his part in the disturbances at the Cemetery of Montmartre, and was imprisoned; on his release he founded the *Satan*, which was soon repressed, like the *Corsaire*. Afterwards he was imprisoned for three months because of his republicanism; and in 1870 proposed the impeachment of the Emperor, and was sentenced to two years in prison, regaining his liberty on the downfall of the Empire. His historical works include: *Histoire anecdotique illustrée de la Révolution de 1848* (1868); *Histoire de cent ans* (1884); and the valuable *Dictionnaire universel illustré de la vie française contemporaine* (1874). He wrote three plays—*La lettre rouge*, *Turenne*, and *La criminelle*; and many novels, using the pseudonym 'William Cobb' as well as his own name, such as *Les mystères de New York* (1874); *Les mille et une femmes* (1879); *Le fils de Monte Cristo*, and *Le trésor de Monte Cristo*, continuing Dumas (1885); *La science occulte* (1890); and *Alise* (1893). He translated Shakespeare (1887-98).

LERMOLIEFF, lĕr-mō'lyĕf, Ivan. The pseudonym of the Italian art critic Giovanni Morelli (q.v.).

LERMONTOFF, lyĕr'mŏn-tŏf, Mikhail Yuryevitch (1814-41). The greatest Russian poet after Pushkin. He lost his parents at an early age and was reared by his grandmother. After a few years' sojourn in the Caucasus, he entered in 1828 the school for nobles attached to the Moscow University, and in 1830 the university, from which he was expelled in 1832 for misconduct. He then entered a military school at Saint Petersburg and became an officer of the Imperial Guard Hussars in 1834. A poem written in 1837 after Pushkin's death, "On the Death of a Poet," in which he openly reproached the courtiers for Pushkin's death, so displeased Nicholas I. that he sent him to serve in the Army of the Caucasus as an ensign. Pardoned in 1838, he returned to Saint Petersburg, but in 1840, after a duel with Barante, son of the French Ambassador, he was again sent to the Caucasus. Here he was killed in a duel by his comrade Martynoff, who thought himself described in Grushnitski, a character in Lermontoff's *Hero of Our Time*. A purely subjective poet, he was alone in society, little understood by his friends, who always feared him and sometimes hated him for his merciless ridicule and stinging satire. He was the Byron of Russia, and in striving after intellectual heights he breathed freely when away from 'loathsome society' in the high regions of the Caucasus, which produced an indelible impression on him in his childhood. Lermontoff began one of his best longer poems, "The Demon," when barely fifteen, and continued rewriting it until his death; yet careful study reveals little difference in the power of its various drafts. His fame spread like wildfire after the ill-starred "On the Death of a Poet," and when, a short time later, he published his "Song of the Merchant Kalashnikoff," he was easily at the head of the Russian poets. This is the finest specimen of its kind in Russian literature—an artistic production, faithfully preserving the spirit and form of the folksong. Besides various dramatic and epic works, he wrote a great number of lyric poems. The *Hero of Our Time*, a prose novel consisting of five separate sketches, appeared with a preface in 1841, but installments of it were originally published in a periodical during 1839-40. The novel is of some autobiographical value. The best editions of Lermontoff's works are those by P. A. Viskovatoff (1891), A. I. Vvedyenski (1891), and I. M. Boldakoff (1891). *The Hero of Our Time* was translated into English by Pulski (1854), anonymously (1854), and, with a biographical sketch, by Ivan Nestor-Schnurmann (Cambridge University Press, 1899). *The Circassian Boy* (*Mtsyri*), translated by S. S. Conant (Boston, 1875); and *The Demon*, translated by Stephen (London, 1875). F. F. Fiedler's German translations of Lermontoff's poems are remarkable for their fidelity to the original.

LEROLLE, le-rôl', Henri (1848—). A French painter, born in Paris. He studied under Lamothe, and received a first-class medal at the Salon of 1880. Among his works are: "Communion des Apôtres" (1878); "A l'orgue" (in the Metropolitan Museum, New York City, 1885); and "Dans la campagne" (1880), in the Luxembourg. His favorite subjects are large landscapes with few figures, and his effects of evening light are notable.

LEROS, lĕr'ôs, or **LERO**, lĕr'ô. An island of the Grecian Archipelago, one of the Sporades, belonging to Turkey, situated about thirty miles south of the island of Samos (Map: Turkey in Europe, F 6). Its area is estimated at from 20 to 25 square miles. The surface is mountainous, but the soil fertile, producing grapes, olives, and grain. Population, estimated at 4000, mainly Greeks. The chief town, Leros or Marina, has a castle, and about 1500 Greek inhabitants.

LEROUX, le-rōō', Charles Marie Guillaume (1814-95). A French landscape painter, born at Nantes. He was educated for the bar, but soon gave up the practice of law and studied landscape painting under Corot. Except his first exhibition at the Salon of 1836, a "Vue intérieure du cloître de Santa Maria della Pace à Rome," his work consists entirely of outdoor views. The more important of his pictures are: "Souvenir de Fontainebleau" (1834); "Fête de Haut Poitou" (1844), at the Museum of Besançon; "Souvenirs de Pornic" (1853); and, at the Museum of Nantes, "L'Erdre pendant l'hiver" (1857), "Souvenir du Poitou" (1869), "Dunes des chênes verts" (1884), and "Le chemin près Paimbœuf" (1894).

LEROUX, Frédéric Etienne (1836—). A French sculptor, born at Ecouché, Department of Orne. A pupil of Jouffroy and of the Ecole des Beaux-Arts, he made his first appearance at the Salon of 1863, with a plastic group "Faunes." He won a second-class medal at the Exposition of 1878 and a silver medal at the 1889 Exposition. His better-known works include the plaster statue "Ariane abandonnée" (1865); the bronze "Marchand de violettes" (1866), later put in the Luxembourg; a marble "Bouquetière" (1869), now at the Museum of Lille; "Demosthène au bord de la mer" (1875 and 1878); and "Jeanne d'Arc" (1880).

LEROUX, Hector (1829—). A French painter of classical subjects, born at Verdun. He studied under Picot and won the second Prix de Rome in 1857 with his "Lazarus." He was commissioned by the French Government to copy Titian's "Sacred and Profane Love" in 1860. Of his works, many owned in America, mention should be made of: "Une nouvelle vestale" (1863), at the Museum of Verdun; "Columbarium" (1864), at the Luxembourg; the very powerful "Messaline" (1868); the "Vestale Tuccia" (1874), at the Corcoran Gallery, Washington; "Amata" and "Nouvelles du dehors" (1891); and "Un coin de la villa Médicis" and "Agar et Ismaël" (1892). He is not merely classical in his subjects, but seems to prefer the unromantic lack of action and absence of any emotion unless it be commingled with cold dignity.

LEROUX, Henri, called Hugues (1860—). A French journalist and romance writer, born at Havre. He contributed to the *Revue Politique et Littéraire,* the *Temps, Matin, Journal, Figaro,* etc., articles written in a peculiarly pleasing style, which also characterized his romances, such as *Un de nous* (1886), *Les larrons* (1890), *Les amants byzantins* (1897), *Le maître de l'heure* (1897), and *Le fils à papa* (1900). He published a book upon *La Russie souterraine* (1885), and a Nihilist novel, *L'attentat Sloughine,* the same year, but afterwards turned his attention to the underground life of his own city, and issued *L'enfer parisien* (1888). He visited the United States at the beginning of the twentieth century and lectured at Harvard. His more serious works include: *Notre patron Alphonse Daudet* (1888); *Les jeux du cirque et la vie foraine* (1889); *Portraits de cire* (1891); *Marins et soldats* (1892); *Les mondains* (1893); and *Nos filles; qu'en ferons-nous?* (1898). Among his travel sketches are: *Au Sahara* (1891); *En yacht* (1892); and *Notes sur la Norvège* (1894). He adapted Dostoyevski's *Crime and Punishment* for the stage, besides writing the play *L'autre France* with Decourcelle (1900).

LEROUX, Louis Eugène (1833—). A French painter, born in Paris. He was a pupil of Picot, and painted genre studies of Brittany. Among these mention should be made of "La lettre de l'armée" (1861); "Le nouveau-né" (1864), now at the Luxembourg; "Avant l'ensevelissement" (1868); "L'heureuse mère" and "La prière" (1869); also "Avant la confession" (1872) and "Jeune mère" (1886). Leroux was decorated with the cross of the Legion of Honor in 1871.

LEROUX, Pierre (1797-1871). A French radical publicist and philosopher, born in Paris. After studies at the Lycée Charlemagne he founded (1824) the *Globe,* an organ of literary and social reformers, which in 1831 became converted to the socialism of Saint-Simon. Leroux then (1832) became editor of the *Revue encyclopédique,* and in collaboration with Jean Reynaud undertook the *Encyclopédie nouvelle,* to continue the philosophic propagandism of the old *Encyclopédie.* (See Diderot.) In 1839 he summed up his philosophic creed in *De l'humanité, de son principe et de son avenir,* teaching development toward perfection. In 1841 he joined with George Sand and Viardot to found the *Revue Indépendante,* translated Goethe's *Werther* in 1843, and in 1848 was an ultraradical delegate to the National Assembly. After the coup d'état (1851) he sought refuge in Jersey and at Lausanne, but he returned in 1869. The titles of his more prominent writings indicate their character: *Du christianisme et de ses origines démocratiques* (1848); *Malthus et les économistes, ou y aura-t-il toujours des pauvres?* (1848); and *Job,* a drama (1865). He was an honest, enthusiastic, and visionary radical.

LEROY, le-rwä′, Jean Jacques Joseph, known as Leroy d'Etiolles (1798-1860). A French surgeon, born in Paris. In 1822, while a medical student, he invented a set of instruments for performing the operation of lithotrity (q.v.). His works include: *Exposé de divers procédés employés pour guérir de la pierre; De l'extraction des corps étrangers;* and his translation into French of Cooper's *Dictionary of Surgery.*

LE ROY, Marin. See Gomberville, Marin Le Roy, Seigneur de.

LEROY, William Edgar (1818-80). An American naval officer. He was born in New York, entered the navy as midshipman in 1832, and became a lieutenant in 1843, a commander in 1861, a captain in 1866, a commodore in 1870, and a rear-admiral in 1874. He commanded the *Keystone State* in the engagement with Confederate ironclads off Charleston in January, 1863, and the *Ossipee* at the battle of Mobile Bay, on August 5, 1864, and on both occasions was conspicuous for skill and bravery. From 1876 to 1879 he commanded the South Atlantic squadron, and in 1880 was retired from active service.

LEROY-BEAULIEU, le-rwä′bō′lyẽ′, Anatole (1842—). A French publicist, born at Lisieux, in the Department of Calvados. He devoted himself to the study of the history of art and published in 1866 *Une troupe de comédiens,* followed in 1875 by *La restauration de nos monuments historiques devant l'art et devant le budget.* In 1881 he became professor of modern history at the Ecole Libre des Sciences Politiques, and in 1887 was made a member of the Academy of Moral and Political Sciences. In the *Revue des Deux Mondes,* with which he became connected soon after the publication of his second work, he published a number of important political and social studies, subsequently reprinted in book form. Chief among these are *L'empire des Tsars et les Russes* (1887-89), an excellent treatise on the history, politics, and social life of Russia, based on personal observation during a journey undertaken in 1872, and a long sojourn in that country; *Un homme d'état russe* (*Nicolas Milutine*) (1884); and *La France, la Russie, et l'Europe* (1888). Various phases of contemporary social development are treated in *Les catholiques libéraux, l'église et le libéralisme* (1885); *La révolution et le libéralisme* (1890); *Les juifs et l'antisemitisme, Israël chez les nations* (1893).

LEROY-BEAULIEU, Pierre Paul (1843—). A French economist, brother of Anatole. He was born at Saumur, December 9, 1843, studied at Paris, Bonn, and Berlin, and subsequently wrote numerous articles for various French publications. In 1867 he published his first large work, *L'influence de l'état moral et intellectuel des populations ouvrières sur le taux des salaires.* In 1872 he became professor of finance at the Ecole Libre des Sciences Politiques. In 1880 he succeeded his father-in-law, Michel Chevalier, as professor of political economy at the Collège de France. He was frequently a candidate for the Chamber of Deputies, but was never successful. He became the leading exponent of free trade in France, and founded the *Economiste Français* to give utterance to his views. Among his important works are: *La colonisation chez les peuples modernes* (1873); *Traité de la science des finances* (1877); *Précis d'économie politique* (1888); *L'état moderne et ses fonctions* (1889); *Traité théorique et pratique d'économie politique* (1895); *La rénovation de l'Asie, Sibérie, Chine, Japon* (1900; Eng. trans., *The Awakening of the East*, New York, 1900).

LERP INSECT. Any one of several and perhaps many Australian flea-lice (Psyllidæ), whose cases, known as 'lerp' or 'leap,' are eaten by the natives. The larval cases of these insects (some of which belong to the genera Spondyliaspis and Cardiaspis) are not mere waxy excretions which harden on exposure to air, but they are spun by the larvæ, each case being constructed and inhabited by a single larva. Some of the cases are objects of great beauty and resemble 'exquisite examples of miniature basket-work,' or a valve of a cockle-shell.

LERWICK, lĕr′wĭk *or* lĕr′ĭk. The chief town of the Shetland Islands (q.v.), Scotland, on Mainland, on Bressay Sound, 110 miles northeast of Kirkwall (Map: Scotland, G 1). Fishing is the chief branch of industry. The harbor is commodious and safe. It has a public pier 300 feet in length and is defended by a fort built in the time of Cromwell. Lerwick is one of the principal Scottish stations for the royal naval reserve, and the seat of the Shetland law courts. Population, in 1891, 3930; in 1901, 4061.

LÉRY, lā′rā′, JEAN DE (1534-1601). The first Protestant minister who preached on the American continent. He was a Calvinist, and, with several other ministers, was sent from Geneva in 1556 to preach among the colonists established at Rio Janeiro, Brazil, by Coligny and Villegagnon. The ministers and the patron quarreled, and the former had a hard time of it. After many sufferings and dangers they returned to France. Léry served as pastor in several cities. He wrote *Histoire d'un voyage fait en la terre du Brésil* (1578).

LESAGE, le-säzh′, ALAIN RÉNÉ (1668-1747). A French novelist and dramatist, born in Sarzeau, Brittany, May 8, 1668, famous for his *Gil Blas*. Left an orphan at fourteen and despoiled by his uncles of his patrimony, he went to Paris in 1690, studied for the law, married in 1694, gave up law for letters, won the patronage of the Abbé de Lyonne, from whom he received a pension of 600 livres, and supported himself by hack work in not always faithful translations from the Spanish (*Théâtre Espagnol*, 1700; Avellaneda's unauthorized *New Adventures of Don Quixote*, 1704; etc.). Lesage's original work in both fiction and drama begins with 1707 with the comedy *Crispin, rival de son maître*, and the novel *Le diable boiteux*, the idea for which was borrowed from Guevara's *Diablo Cojuelo* (1641) and the details from other sources, though none could question the originality of its wit and spirit. Then followed Lesage's greatest comedy, *Turcaret* (1709). In this play Lesage fiercely assailed the tax-gatherers or *traitants*. Such was their power that they could keep this play off the stage for a while, but the Dauphin took sides with Lesage and *Turcaret* was put on. His trouble with the Théâtre Français led him to work thereafter for the rival and inferior Théâtre de la Foire, for which Lesage wrote a host of farces and light operettas, once popular but now forgotten, giving his ripest thought meantime to *Gil Blas*, his greatest novel, begun in 1715, continued in 1724, completed in 1735, and revised in 1747. *Gil Blas* is derived in part from the following works: *Disgrazia del conte d'Olivare*, in a French translation; from a French work founded on the *Anecdotes du comte-duc d'Olivares*, by M. de Valdory; from the *Histoire du comte-duc avec des réflexions politiques et curieuses* (Cologne, 1683). Lesage also borrowed from the life of Obregon, and from a number of Spanish narratives or plays. The *Lazarillo de Tormes* is a prototype of *Gil Blas*. The borrowed episodes of *Gil Blas* constitute about one-fifth of the whole. It tells the story of a young rogue who is cast upon the world and has innumerable adventures which he recounts in a light, satirical, low, and often cynical vein. Lesage wrote also a French adaptation of the Spanish *Guzman d'Alfarache* (1732), a picaroon novel, and the similar though more independent picaroon stories, *Estevanille Gonzales* (1734) and *Le Bachelier de Salamanque* (1736), as well as *Les aventures du chevalier de Beauchesne* (1732), founded on contemporary memoirs, all works little read, and not likely to be much read, but not without interest as experiments in realistic fiction.

Lesage's domestic life was happy and uneventful. He lived respectably, on the borderland of Bohemia, and if he died poor it was rather because he was independent than because he was reckless, his good humor being always restrained by a sane judgment. In his lifetime, though always popular, he was enjoyed rather than appreciated, for, though not a creative genius, he was so keen an observer and so remarkable an assimilator as to be in several ways an innovator; not the father of realism, but its prophet. *Le diable boiteux* is a satire on contemporary Parisian society, under a Spanish veil, owing more to La Bruyère's *Caractères* than to Guevara. Keys were soon provided in abundance, and even now the allusions to Fontenelle, Ninon de l'Enclos, Voltaire, and others are unmistakable. *Crispin* and *Turcaret*, too, are prose pictures of Parisian life, the former farcical, the latter a cruelly realistic satire on mercantile pettiness, provincial narrowness, and most of all on the new plutocracy. This satiric realism finds its final expression in *Gil Blas*, the story of a self-made man and studied more from French life than from any Spanish romance. At least four men were then living in France—Dubois, Alberoni, Barjac, and Gourville—valets or favorites, whose adventures might have suggested those of Lesage's Spanish hero. The story aims through the experiences of a checkered life to show how character is formed by environment, how impressions rouse reflection, reflection stirs conscience, and both react on conduct so as gradually to transform it. That is the moral, and to draw it Lesage paints the world as he finds it with keen understanding and the charity of wisdom. So *Gil Blas* has endured for nearly two centuries as a gospel of a worldly-wise man's common sense. Lesage's permanence in French literature seems more assured to-day than at any time since his death, which occurred in Paris, November 17, 1747.

Lesage's works are best edited by Renouard in 12 volumes (1821), to be supplemented by *Le Théâtre de la Foire* (10 vols., 1737) and unpublished manuscripts in the French National Library. Consult: the *Life* by Lintilhac (Paris, 1893); the Introduction by Anatole France to Lemerre's ed. of *Le diable boîteux;* Brunetière, *Critiques*, vol. iii. (Paris, 1880); Faguet, *XVIIIème siècle* (ib., 1885); Sainte-Beuve, *Causeries*, vol. ii. (ib., 1881); L. Claretie, *Lesage romancier* (ib., 1890); Barberet, *Lesage et le Théâtre de la Foire* (Dijon, 1887).

LES'BIA. The name under which Catullus in his love poems celebrates the beautiful and shameless Clodia.

LESBIAN POETS, The. A term used to designate the four poets of Lesbos, Terpander, Alcæus, Arion, and Sappho.

LESBOS, lĕz'bŏs. An island in the Ægean Sea, belonging to Turkey since the Middle Ages, and frequently called Mytilene from the name of its chief city in ancient and modern times (now also called Kastro) (Map: Turkey in Europe, E 5). Area 675 square miles. It is mountainous and densely forested and is nearly cut in two by the Bay of Kaloni, that indents from the southwest; the highest peak reaches an altitude of 3077 feet. The principal products are olive-oil (about 15,000 metric tons a year), figs, and almonds, and there are tanneries, silk and soap factories. The imports are grain, flour, sugar, tobacco, alcohol, sulphur, and petroleum; they amounted in value in 1896 to about $2,500,000. The exports for the same year were about $250,000 more. Population, in 1896, 125,000, of whom less than 10 per cent. are Mohammedans. Lesbos is famous as the birthplace of the poets Sappho, Alcæus, Terpander, and Arion, of the statesman Pittacus, of the historian Hellenicus, and of the philosophers Theophrastus and Phamas. For the ancient history of the island see the article on the city of Mytilene, the capital. In the fourteenth century Lesbos was conveyed by the Byzantine Emperor to a Genoese family whose last duke, in 1462, lost it to Mohammed II. In 1690-98 the Venetians, and in 1821 the Greeks, defeated the Turks in naval battles here. Consult Tozer, *Islands of the Ægean* (London, 1890).

LESCARBOT, lĕ'skär'bō', Marc (c.1570-1630). A French traveler and writer, born at Vervins. He studied law and became an advocate before the Parliament of Paris. With his friend Pontrincourt he went to Canada in 1605 to relieve the settlement at Port Royal. After the monopoly of the fur trade was broken, the settlement was abandoned, and in 1607 he returned to France, where he published *Histoire de la Nouvelle France* (Paris, 1609; 2d ed. 1612). The edition of 1618 contains in addition *Muses de la Nouvelle France*. The history describes the voyages of Verazzani, the settlement in Florida, the expedition to Brazil, and De Monts's colony in Acadia, the last being the first attempt to found an agricultural colony in America. Later he was secretary of the French Embassy in Switzerland, and wrote some books of travel. Consult an article by Biggar, "Marc Lescarbot of Vervins, the French Hakluyt," in the *American Historical Review*, vol. vi. (New York, 1901).

LESCHES, lĕs'kēz (Lat., from Gk. Λέσχης). One of the so-called cyclic poets, who flourished in the first half of the seventh century B.C. He was born at Pyrrha, near Mytilene, and is usually regarded as the author of the epic entitled *The Little Iliad* (Ἰλιὰς ἡ ἐλάσσων, or Ἰλιὰς μικρά), in four books. This poem, which was intended as a supplement to the *Iliad* of Homer, narrated the events after the death of Hector, the fate of Ajax, the exploits of Philoctetes, Neoptolemus, and Odysseus, and the final destruction of Troy. From the last part of the work, which, like the first part of the poem of Arctinus, was called *The Destruction of Troy* (Ἰλίου πέρσις), Pausanias makes several quotations describing the sacking of Troy and the taking away of the prisoners. Consult: Aristotle, *Poetica* 23; and Müller, *Fragmenta Historicorum Græcorum* (Paris, 1868-83).

LESCHETIZKY, lĕsh'e-tĭts'kĭ, Theodor (1831—). An Austrian pianist, born in Lemberg. As a piano virtuoso he was very favorably received in London, Holland, Berlin, and Vienna; and in a lesser degree for his compositions, which include *Souvenirs d'Italie*, *Suite à la campagne*, and many other similar pieces, as well as an opera, *Die erste Falte*, first given in Prague in 1867, and afterwards at Wiesbaden in 1881. He is, however, principally famous as a teacher; he was one of the principal instructors of Paderewski, and has been very popular with American students studying abroad. His own teachers were his father, Czerny, and Sechter. In 1852 he joined the Faculty of the Saint Petersburg Conservatory, and acted as conductor of the orchestra of the Grand Duchess Helen during the absence of its regular conductor, Rubinstein. Ill health compelled him (in 1878) to leave the country. In 1880 he married a former pupil, Annette Essipoff, and took up his residence in Vienna as a teacher. He subsequently moved to Wiesbaden.

LESCOT, le-skō', Pierre (c.1510-78). One of the greatest French architects of the Renaissance. Little is known of his life. He was born between 1510 and 1515, and is called a Parisian by Jean Goujon in his introduction to Martin's translation of Vitruvius. His praises were sung by the poet Ronsard, who wrote him an epistle from which we know that he was Seigneur de la Grange du Martroij, Seigneur de Clagny, Abbé Commendatoire de Clermont (1554), and canon of the Cathedral of Notre Dame, Paris. His first known work was the rood-screen of Saint-Germain-l'Auxerrois, Paris (1541-44), and he designed the architectural part of Jean Goujon's (q.v.) Fountain of the Nymphs, in Paris. The plans for Hotel Carnavalet, Paris, are also attributed to him. His masterpiece was the west wing of the Louvre, begun in 1546, by which the renovation of the old Gothic palace was commenced. Lescot was the real founder of the purely classic school in France, previous work having been mainly the result of an amalgamation of Gothic and classic elements. Consult: Berty, *Les grands architectes français* (Paris, 1860); Palustre, *La renaissance en France* (Paris, 1880).

LESDIGUIÈRES, lā'dē'gyâr', François de Bonne, Duc de (1543-1626). An able French general, born at Saint-Bonnet-de-Champsaur, and educated at Avignon and at Paris in the Collège de Navarre. He suddenly gave up the law and entered the army under Bertrand de Gordes, but soon left it to join the Protestant party. He was in the thick of the religious civil war, and did much for the cause of Henry IV. He commanded the King's armies against Charles Emmanuel I. of Savoy with great success (1591-92); and in 1597 raised an army at his own expense, beat the Spaniards, and in the following year again defeated the Duke of Savoy. He succeeded in making himself practically ruler of Dauphiné. He was made Marshal of France in 1608, and three years afterwards Duke of Lesdiguières. Under Louis XIII. Lesdiguières fought for the cause of Savoy against the Spaniards. He finally abjured Calvinism and commanded against the Huguenots, being rewarded for his services by being made Constable of France. Consult Dufayard, *Le connétable de Lesdiguières* (Paris, 1892).

LESGHIANS, lĕz′gĭ-*a*nz, or LESGHIAN-TCHETCHEN. A group of peoples of the Caucasus, comprising the eastern division of Lesghians proper, the more central Tchetchenzes, and some other peoples, whose exact relations are still somewhat in doubt. The Lesghians, who mainly inhabit Daghestan (sometimes called Lesghistan), and who number about half a million, comprise the Avars, Kurins, and other tribes. The Tchetchenzes comprise the Tchetchenzes proper, the Karabulaks, Tushes, etc. The Georgian name for the Tchetchenzes is Kists. They call themselves Naktchuoi. Keane (1896) considers that some of the languages of this region of the Caucasus, as the Ude, Kubachi, Andi, etc., "must for the present be regarded as so many stock languages," while according to Uslar some of the languages of Southern Daghestan are practically 'inflectional.' Shamyl, whose capture by the Russians in 1859 ended a thirty years' heroic struggle for Lesghian independence, was an Avar. The Lesghian group includes many of the wilder and more independent tribes of the Caucasus. Their physical features, too, are less prepossessing than those of the Georgians, Circassians, etc. The Lesghians (particularly the eastern tribes) are very brachycephalic, with a fairly high stature. The face sometimes suggests Mongolian admixture, the nose Semitic. Light-gray eyes and fair hair are rather common among them. Some authorities (Müller, 1879; Brinton, 1890) classify the Lesghians and Kists (Tchetchenzes) as two different groups. Anthropological and ethnological information about the Lesghians will be found in the following works: Wagner, *Schamyl* (Leipzig, 1854); id., *Die Völker des Kaukasus und ihre Freiheitskämpfe gegen die Russen* (Berlin, 1855); Cunninghame, *Eastern Caucasus* (London, 1872); Rittich, *Die Ethnographie Russlands* (Gotha, 1878); Erckert, *Der Kaukasus und seine Völker* (Leipzig, 1885); Chantre, *Recherches anthropologiques dans le Caucase* (Lyon, 1885-87); Hutchinson, *Living Races of Mankind* (London, 1901).

LE SICILIEN, OU L'AMOUR PEINTRE, le sē′sē′lyăN′ ōō lȧ′mōōr′ păN′tr′ (Fr., The Sicilian, or Love as a Painter). A comedy by Molière (1667). In this slight sketch Adraste, in the character of a painter, hoodwinks Don Pèdre, and elopes with the latter's Greek slave, Isidore, disguised as his own slave, Zaïde.

LESKIEN, lĕs′kē-*e*n, AUGUST (1840—). A German philologist. He was born at Kiel and studied there, at Leipzig, and at Jena, where he specialized in Slavic linguistics under Schleicher (1866-67), and was made professor of comparative philology in 1869. A year later he went to Leipzig to give the first course there in Slavic languages. With Burgmann he edited *Litauische Volkslieder und Märchen* (1882). In 1884 he became an editor of Ersch and Gruber's *Realencyklopädie.* His other writings include: *Indogermanische Chrestomathie*, with Ebel, Schleicher, and Schmidt (1869); *Handbuch der altbulgarischen Sprache* (3d ed. 1898); *Die Deklination im Slawisch-Litauischen und Germanischen* (1876); *Untersuchungen über Quantität und Betonung in den slawischen Sprachen* (1885-93); and *Die Bildung der Nomina im Litauischen* (1891).

LES′LEY, or **LESLIE**, JOHN (1527-96). A Scotch prelate, statesman, and historian, the natural son of the parish priest of Kingussie, Inverness-shire. He graduated M.A. at King's College, Aberdeen, and in 1547, in his twentieth year, became a canon of Aberdeen Cathedral. In 1549 he went to France, where he studied canon and civil law at the universities of Poitiers and Paris. He returned to Scotland in 1554 to take up an appointment as professor of canon law in his alma mater, and in 1559 he was appointed Canon and Prebendary of Oyne. He was a strenuous opponent of Knox and of the introduction of Protestantism into Scotland, and was one of the commissioners sent to invite Queen Mary to Scotland; on her accession he became her chief ecclesiastical adviser, and in 1566 was made Abbot of Lindores and in the same year Bishop of Ross. His loyalty to his Queen subjected him to much dangerous intrigue, and after her imprisonment in Bolton Castle, in 1568, he went to plead her cause at the Court of Elizabeth. In 1571 he was imprisoned in the Tower of London for complicity in the projected marriage of Mary to the Duke of Norfolk, for his share in the resulting uprisings in the north of England, and for his attempts to secure Spanish intervention. The confession extorted from him led to Norfolk's execution. In 1573 he was released by Elizabeth, but was banished from the Kingdom. He went to France, and continued to intercede, but unsuccessfully, for his Queen at various Continental courts until her death. He visited Rome and received several traveling commissions from the Pope. In 1579 he was appointed Suffragan and Vicar-General of the Diocese of Rouen, where in 1591 his efforts in stimulating the citizens to resist successfully the siege during the Civil War were rewarded by Clement VIII., who appointed him Bishop of Coutances. The disturbed state of the country, however, prevented him from proceeding to his see, and he retired to the Augustinian Monastery of Guirtenburg, near Brussels, where he died. He was the author of several Latin and English publications, many of them written in defense of Queen Mary. His most important work is *De Origine, Moribus et Rebus Gestis Scotorum* (Rome, 10 vols., 1578), a Latin abridgment in seven volumes of the work of Boëthius, with three original volumes in the Scotch dialect, dealing with the period from the death of James I. in 1437 to the return of Queen Mary to Scotland in 1561.

LESLEY, J. PETER (1819-1903). An American geologist, born in Philadelphia. He graduated at the University of Pennsylvania in 1838, and then spent three years assisting Henry D. Rogers in the first geological survey of Pennsylvania. In 1841 he entered the Princeton Theological Seminary, and upon his graduation in 1844 was licensed as a minister by the Presbytery of Philadelphia. He then went to Europe, where he traveled on foot through France, Savoy, Switzerland, and Germany, and spent some time at the University of Halle. On his return to the United States, in 1845, he was sent by the American Tract Society into the mountainous regions of Pennsylvania, where he worked among the ignorant mountaineers until 1848, when he became pastor of a Congregationalist church in Milton, Mass. Two years later he resigned, because of a change in his religious beliefs, and returned to Philadelphia, where he became a professional geologist. He made extensive researches in the coal, oil, and iron fields of the United States and Canada, and became an acknowledged authority on the coal-fields of North America. He was appointed secretary of the American Iron Association in 1855, secretary and librarian of the American Philosophical Society in 1858, and State geologist of Pennsylvania in 1874. From 1872 until 1878 he was professor of geology at the University of Pennsylvania, and in 1886 was appointed emeritus professor there. The Pennsylvania Railroad Company sent him to Europe in 1863 to examine the Bessemer iron works, and in 1867 the United States Senate appointed him one of the commissioners to the World's Fair in Paris. Besides the works which he edited, and the numerous papers by him which appeared in scientific magazines, he published: *A Manual of Coal and Its Topography* (1856); *Man's Origin and Destiny from the Platform of the Sciences* (1868); *The Iron Manufacturer's Guide* (1858); *Historical Sketch of Geological Explorations in Pennsylvania* (1876); and *Paul Dreifuss, His Holiday Abroad* (1882).

LESLIE, CHARLES (1650-1722). A British Jacobite non-juror and controversialist. He was born in Dublin, Ireland, graduated at Trinity College, Dublin, removed to England in 1671, and began the study of law at the Temple, but soon abandoned this for divinity, and was admitted to orders in the Church of England in 1680. Returning to Ireland, he was appointed, in 1687, Chancellor of Connor. Living in Ireland at the time of the Revolution, he distinguished himself in disputations with the Roman Catholics in defense of Protestantism. Though a zealous Protestant, he adhered to King James, refusing to acknowledge William as his rightful sovereign. After the death of James II. he transferred his allegiance to his son, the Pretender, and was sent by some opulent Jacobite gentlemen, in 1709, to Bar-le-Duc to convert him; when the Pretender removed to Italy he accompanied him. In 1721 he obtained permission from George I. to return to his native land, and took up his abode at Glaslough, Ireland, where he died on April 13, 1722. His theological works excited much attention and have been frequently reprinted. The most prominent are: *Gallienus Redivivus* (1695), which gives the facts of the massacre of Glencoe; *The Snake in the Grass* (1696); *A Short and Easy Method with the Deists* (1698); *A Short and Easy Method with the Jews* (1699); *The Truth of Christianity Demonstrated* (1711). In his political controversies he was the advocate of high monarchical principles. His collected works were published in two volumes (London, 1721), and reprinted in seven volumes (Oxford, 1832).

LESLIE, CHARLES ROBERT (1794-1859). An English genre painter, of American descent. He was born in London, October 19, 1794, of American parentage. His father, a watchmaker of Philadelphia, died in 1803, upon his return to that city, leaving his family destitute. Charles Robert was apprenticed to a bookseller, but evinced great aptitude for drawing, and at the age of seventeen he drew a portrait of the actor George Frederic Cooke, which was esteemed so excellent that a subscription was raised to enable him to study abroad for two years. In 1811 he went to London, and was hospitably received by Benjamin West, president of the Royal Academy. He became one of a group of Americans, among whom were the painters Aleston and King, Washington Irving, and John Constable.

His first picture exhibited at the Academy was a melodramatic production, entitled "Murder" (1813). Not until after his visit to Paris, in 1817, did he exhibit his special talent, the painting of humorous historical genre, in his "Sir Roger de Coverley Going to Church." During this period he designed illustrations for Irving's *Knickerbocker History of New York* and *Sketch-Book*, also painting his portrait. In 1822 "May-day Revels in the Time of Queen Elizabeth" secured his election as an associate of the Academy. In company with Sir Edmund Landseer he visited Sir Walter Scott at Abbotsford in 1824, and painted his portrait. In 1825 he married Miss Stone, a celebrated beauty, and in 1826 he became an Academician. Elected professor of drawing at West Point in 1833, he returned to London after a trial of a few months. In 1838 he was summoned to Windsor to paint the "Queen Receiving the Sacrament After the Coronation," now in Buckingham Palace. He was professor of painting at the Royal Academy from 1848 to 1852, and published his admirable lectures to the students as a *Handbook for Young Painters* (1855). Other works are: *The Memoirs of Constable* (1865), whose merits he was among the first to recognize; an incomplete *Life of Reynolds* (1865); and his own *Autobiographical Recollections* (1860), the two last edited by Tom Taylor. Leslie died at Saint John's Wood, London, May 5, 1859.

Leslie is chiefly famous as an illustrator of humorous incidents taken from the great authors. His humor is refined and delightful, and no one has entered more into the spirit of the author. He is a good draughtsman and a skillful composer, but his coloring, especially in his later works, is harsh. The shadows are too black, and there are no middle tones to harmonize them with the light portions. The best known of his pictures is "Uncle Toby and the Widow Wadman" (1831), in the National Gallery. The South Kensington Museum contains, besides replicas, three subjects from Molière, "The Dinner at Mr. Page's House" (1838), and others. In the collection of Lord Leconfield at Petworth, in Sussex, are the originals of the "Taming of the Shrew" (1832, replica at South Kensington), "Sancho Panza in the Apartments of the Duchess" (1828), and three others. Two of the

Sir Roger de Coverley series are at Bowood, in the collection of the Marquis of Lansdowne. In the Philadelphia Academy are a number of replicas and the original of the "Murder of Rutland." Consult Leslie's *Autobiographical Recollections* (London, 1860).

LESLIE, Frank (1821-80). The name assumed by Henry Carter, an American publisher and journalist, born in Ipswich, England. Son of a glove manufacturer, educated in Ipswich, trained to commerce in London, he showed a natural bent for art, and contributed sketches to the *Illustrated London News*, signing them Frank Leslie. These were so cordially welcomed that he gave up commerce and was made superintendent of engraving on that journal. He made himself an expert and inventor in his new work, and in 1848 came to the United States, and in 1854 began publishing the first of his many illustrated journalistic ventures, *The Gazette of Fashion*. *The New York Journal* soon followed with *Frank Leslie's Illustrated Newspaper* (1855) (now *Leslie's Weekly*), *The Boy's and Girl's Weekly*, *The Budget of Fun*, and many others. He was commissioner to the Paris Exposition of 1867, and received a prize there for his artistic services. His wife, Miriam Florence (Folline), a French Creole of Louisiana, on his death took, by legislative act, the name "Frank Leslie," and for some years conducted the business with conspicuous success.

LESLIE, George Dunlop (1835—). An English landscape and genre painter, born in London. He was the pupil of his father, R. C. Leslie, studied at the Royal Academy, and began to exhibit in 1857. He was made an R.A. in 1876. The setting of his dainty pictures is usually the soft English country scenery, and his color is light and delicate. His works include: "School Revisited" (1875); "Pot Pourri" (1874); "Convent Garden;" "Hen and Chickens;" and "This is the Way We Wash Our Clothes." His publications include: *Our River* (1881); *Letters to Marco* (1894); *Riverside Letters* (1894); and *The Wishing Well* (1901).

LESLIE, Henry David (1822-96). An English composer and conductor, born in London. He studied music with Charles Lucas, became honorary secretary of the Amateur Musical Society in 1847, and served as its conductor from 1853 to its dissolution in 1861. In 1855 he founded the Henry Leslie's Choir, and was its conductor until 1880, when it disbanded. In 1878 it had won the first prize at the Paris International Competition, and in 1882 the society reorganized, only to again break up five years later. In addition, Leslie for a time conducted the Herefordshire Philharmonic Society and the Guild of Amateur Musicians. His compositions, especially the sacred ones, are of considerable merit, and include the operas, *Romance, or Bold Dick Turpin* (1857), *Ida* (1864); the oratorios, *Immanuel* (1853), *Judith* (1858); the cantatas, *Holyrood* (1860), *Daughter of the Isles* (1861); a Te Deum and Jubilate in B (1846), etc. He died in Wales.

LESLIE, Sir John (1766-1832). A British natural philosopher and mathematician. He was born in Largo, Fife, and was educated at Saint Andrews University. In 1785 he entered the Edinburgh Divinity Hall, but devoted much of his time to the sciences, particularly chemistry. In 1788 he left Edinburgh, having given up all idea of following the Church, and after being two years in America as tutor to the sons of a Virginia planter, he returned to London in 1790. From that time till 1805 he was employed in private teaching, traveling, writing, and making experimental researches. His most important work during this period was a translation of Buffon's *Natural History of Birds* (1793), the invention of a differential thermometer, a hygrometer, and a photometer, and the publication of an *Experimental Inquiry Into the Nature and Propagation of Heat* (1804), in which were contained his discoveries in the radiation of heat. For this research he became noted, and the Royal Society awarded him the Rumford medals. In March, 1805, after much opposition from the Edinburgh clergy, he was elected professor of mathematics in the University of Edinburgh, and soon after commenced the publication of his *Course of Mathematics*. In 1810 Leslie invented the process of producing cold artificially and froze water by using an air-pump and sulphuric acid. (See Liquefaction of Gases.) In 1813 he published a full explanation of his views on the subject; subsequently he discovered a method of freezing mercury. In 1819 he was transferred to the chair of natural philosophy, a position better adapted to his peculiar genius, and in 1823 published one volume of *Elements of Natural Philosophy*, never completed. In 1832 he was knighted, and on November 3d of the same year died at Coates, a small estate which he had purchased near Largo. Besides the instruments above mentioned, he invented an æthrioscope, a pyroscope, and an atmometer.

LESLIE, Thomas Edward Cliffe (1827-82). An Irish economist, born in County Wexford. He was educated at Trinity College, Dublin, and was called to the English bar, but did not practice, as he was elected professor of jurisprudence and political economy at Queen's College, Belfast. A pupil of Maine, he put great stress on the historical study of economics and jurisprudence and specialized in the study of landownership. His *Land System and Industrial Economy of Ireland, England, and Continental Countries* (1870) includes a discussion of the conditions in Belgium and France, and insists on the economic superiority of small holdings to the landlord system. A serious loss of manuscript blocked Leslie's scheme for a history of English economics, but he wrote valuable contributions to the gold question and economic method in *Essays in Political and Moral Philosophy* (1879).

L'ESPINASSE, or **LESPINASSE,** lâ'pē'näs', Julie Jeanne Eléonore de (1732-76). A French writer of remarkable *Letters* and a social leader, born at Lyons. She was the illegitimate daughter of the Countess of Albon. From 1754 to 1764 she lived as companion with the blind Madame du Deffand (q.v.), and presided with her over a fashionable literary salon. They then separated, not amicably, and with the aid of literary friends, especially D'Alembert, with whom L'Espinasse maintained till her death a close though platonic relation, she set up a rival salon as a centre for the younger philosophic school. It was two years after this independent life began, and when L'Espinasse was already thirty-four, that she began to write the letters which have made her famous. The early ones are addressed to a Spaniard, Marquis Gonsalvo de

More; the later, to Count de Guibert. Both breathe an ardent though unmerited devotion, and are in their kind little classics of passion. They were published by Guibert's widow in 1800. Consult: Asse, *Mlle. de Lespinasse et Mme. du Deffand* (Paris, 1877); Bonnefon, in *Revue d'Histoire Littéraire* (Paris, 1897). The career of Mlle. de L'Espinasse serves as the groundwork for a novel by Mrs. Humphry Ward, *Lady Rose's Daughter* (1903). The *Letters* appeared in English dress at Boston in 1903.

LESQUEREUX, lå'ke-rẽ', LEO (1806-89). An American botanist, born at Fleurier, Switzerland, of French Huguenot ancestry. After several years at the academy of Neuchâtel, he went to Eisenach as a teacher of French. Upon his return to Switzerland he became principal in a school at La Chaux de Fonds, but, owing to deafness, he had to give up teaching. His old love of plants led him to study botany as opportunity came, and he published a catalogue of mosses, and later won a prize for a treatise on peat-bogs. These monographs won him the friendship of Louis Agassiz, and enabled him to travel over Northern Europe studying the formation of peat and of coal. In 1848 he went to the United States, lived with Agassiz at Cambridge for a time, and then became the assistant of William S. Sullivant. The two, after expeditions into the mountains of the South, published *Musei Americani Exsiccati* (1856) and *Icones Muscarum* (1864). Afterwards Lesquereux again took up his study of coal formation, traveled in Ohio, Pennsylvania, Kentucky, Illinois, and Arkansas, and worked on the geological surveys of these States. Among his reports the "Catalogue of the Fossil Plants which have been named or described from the Coal Measures of North America," the first and the second reports of the Pennsylvania Geological Survey (1880), is the most important work in this field. He also wrote: *Contributions to the Fossil Flora of the Western Territories* (1874-83); *The Flora of the Dakota Group*, edited by F. H. Knowlton (1891); and, with Thomas P. James, the continuation of Sullivant's work, *Manual of the Mosses of North America* (1884). He became entirely deaf in middle life, but was an expert lip-reader.

LES'SEPS, *Fr. pron.* lå'sĕps', FERDINAND, Vicomte de (1805-94). A French diplomat, celebrated for the promotion and construction of the Suez Canal. He was born in Versailles; was early employed in the consular service, and served as consul at Cairo, Rotterdam, Malaga, and Barcelona. In 1848-49 he was Minister to Spain. In 1854 M. de Lesseps went to Egypt and, securing the concurrence of the Viceroy, Said-Pasha, projected the construction of the great interoceanic canal of Suez. In 1856 he published his plans and projects, under the title of *Percement de l'Isthme de Suez*. But the Turkish Government, at the instigation of England, refused its authorization. In spite of many obstructions, M. de Lesseps won the Government to his support, and secured $40,000,000 in subscription to the capital stock required for the construction of the canal. Work was actually begun in 1859. On November 20, 1869, the completion was celebrated with imposing ceremonies. See SUEZ CANAL.

The success of the enterprise determined M. de Lesseps to undertake the cutting of an interoceanic canal across the Isthmus of Panama. A company was organized in Paris in 1876, which procured from the Government of the United States of Colombia a concession to construct a canal on its territory. M. de Lesseps secured to himself the privileges and assumed the conditions of that grant. In 1880 he came from Aspinwall to New York and submitted to American capitalists a matured and detailed plan, etc. He became the president of the company for the construction of the ship-canal, the capital stock of which was 600,000,000 francs. The work was begun in 1881 after a series of difficulties in administration and construction (described under PANAMA CANAL). In December, 1888, De Lesseps and his colleagues resigned, and judicial liquidators were appointed by the Government. In 1893, after a judicial investigation, M. de Lesseps and his son Charles were convicted of misappropriation of the funds of the company, and sentenced to fine and imprisonment; the sentence, however, was never executed.

A record of De Lesseps's many activities will be found in the following published works: *Lettres, journal et documents relatifs à l'histoire du canal de Suez* (1875-81); *Souvenirs de quarante ans* (1887); *Origines du Canal de Suez* (1890). For biographies of De Lesseps consult: Bertrand and Ferrier, *Ferdinand de Lesseps* (Paris, 1887), and Smith, *Life and Enterprises of Ferdinand de Lesseps* (London, 2d ed., 1895). See SUEZ CANAL; PANAMA CANAL.

LESSER CEL'ANDINE. A plant related to buttercup. See RANUNCULUS.

LES'SING, GOTTHOLD EPHRAIM (1729-81). A German critic and dramatist, born at Kamenz, January 22, 1729; the earliest of the great German classical writers. More than any other, Lessing reformed German literature. His father, pastor at Kamenz, gave him his early instruction, and sent him to a famous school at Meissen, where he learned so rapidly that by royal decree he was admitted at seventeen to the University of Leipzig. Here his sturdy nature almost immediately asserted itself against the smug platitudes of the Leipzig critics. "I realized," he wrote at this time, "that books might make me learned, but would never make me a man. I sought society to learn life." He took lessons in dancing, fencing, riding, translated French plays for free theatre tickets, and thus he learned stage technique. In 1747 he printed a little volume of anacreontic verse, and in 1748 produced a juvenile play, *Der junge Gelehrte*. Then, assuring his disappointed father that he 'could become a preacher any day,' he left the theological faculty and entered the school of medicine. Soon afterwards (1748) he left Leipzig for Wittenberg and Berlin, the latter then as now the centre of German free thought. He lived by his pen, writing keen literary criticism and hack translations, and venturing on original dramas and lyrics of no great value.

At Berlin Lessing met Voltaire. They soon quarreled and parted, for Voltaire asserted that Lessing had betrayed a literary confidence, an improbable insinuation often revived by Lessing's literary enemies. Critically Lessing profited greatly by Voltaire. He gained wider horizons and was one of the first among German scholars to address himself directly to the body of the nation. Under his impulse Berlin grew independent of the Swiss school (see BODMER), and his leadership was by 1755 so obvious that there was a demand for a collected edition of his *Works*.

In the same year Lessing went back to Leipzig, and he had begun a journey to England when he was recalled at Amsterdam by the disturbances of the Seven Years' War, at a moment when Frederick's deeds were giving to lyric poetry a popular turn, which was welcomed by Lessing in his preface to the *Lieder eines preussischen Grenadiers* of Gleim (q.v.). He went to Leipzig, attempted a *Faust*, returned to Berlin in 1758, and began to issue *Litterarische Briefe*, which cleared the air of choking mawkishness and false formality. With these *Letters* the classical period of German literature begins and on distinctively national lines. The *Letters* are the oldest German work generally read to-day, and make Lessing 'the Father of German criticism.'

The *Letters* were continued till 1765, irregularly; for in 1760 Lessing went to the seat of war in Silesia as secretary of General Tauenzien and gathered there materials for the greatest drama and the greatest work of æsthetic criticism that Germany had yet seen, *Minna von Barnhelm* (1763) and *Laokoön* (1766). But before these he had produced in *Miss Sara Sampson* (1755) a play epoch-making for the German stage, based on the family relation, the strongest feeling in German national life, and emphasizing the social worth of the middle and lower classes. But the reform that it started has made it seem antiquated. *Minna von Barnhelm*, on the other hand, was a national drama; its personages were Germans of the day, drawn from Lessing's Silesian experience, and all of them true to the soil. In every literary field its health-giving influence was felt.

The *Laokoon* attempts to define the demarcation and the limits of poetry and painting. Only a third of it was ever written, yet that third revolutionized literary taste in Germany. "That long misunderstood phrase, *Ut pictura poësis*, was set aside. The distinction between the speaking and the plastic arts was clear. All the results of this glorious thought were revealed to us as by a lightning flash," said Goethe. Lessing hastened the publication of the *Laokoon*, hoping to win by it the post of royal librarian at Berlin; but Voltaire had prejudiced the King against him. Lessing, however, was called to Hamburg to be critic and adviser of the National Theatre there. Having sold his library to pay debts and rent, with his *Laokoon* unfinished, Lessing left Berlin in April, 1767.

In May, 1767, Lessing began to publish twice weekly the theatrical criticisms known as the *Hamburgische Dramaturgie*. These criticisms soon came to be true essays on dramatic art. The *Dramaturgie* may be regarded as a continuation of the *Laokoon*, and to this day remains the *vade mecum* of the German stage. It gave the death-blow to French imitation and pointed the way to Schiller and Goethe.

In 1769 Lessing suspended the *Dramaturgie*, which pirated reprints had made unprofitable, and was attracted to antiquarian studies by the ill-natured attacks of Professor Klotz, of Halle, against whose journal Lessing openly declared war in the *Antiquarische Briefe*. One of the last *Letters* on *How the Ancients Represented Death* banished the skeleton and hour-glass from German art.

Famous, but poor, Lessing left Hamburg, and in the spring of 1770 became Court librarian of the Duke of Brunswick at Wolfenbüttel. He was now eager to found a home, for he had fallen deeply in love with Eva König, widow of a silk manufacturer of Hamburg. In 1775 he visited her at Vienna, where he was welcomed as no German author had ever been. He was recalled thence to accompany the Duke's son to Italy, and found that his fame had gone before. In February, 1776, he returned and soon afterwards married his betrothed. During these years of waiting he had completed a remarkable tragedy, *Emilia Galotti* (1772). The story is that of Virginia, made familiar by Macaulay's "Lay;" the scene is ostensibly modern Italian, but so obviously German and political in its purpose that the Court of Gotha forbade the representation. Lessing's work as a reformer of the German stage ends here. His *Nathan der Weise* (1779), though still acted, is rather a philosophical work in dramatic form, uniting his ethical and æsthetic studies to the theological controversies that were to fill his later years.

The year after Lessing's marriage was the happiest of his life. On Christmas Eve, 1777, a son was born to him. The child died on Christmas day, the mother on January 10, 1778. Sadly yet bravely, Lessing plunged into three years of intense controversial activity. Of this controversy the immediate cause was Lessing's editing of some posthumous essays by a Hamburg friend, Reimarus, a free-thinker, which Lessing was not, though he was an unflinching believer in free speech, in the higher criticism of Scripture, and in the development of doctrine, as he showed in *Die Erziehung des Menschengeschlechts* (1780). He thought and said that it was better error should be taught than freedom of thought stifled, and, further, that "the letter is not the spirit and the Bible is not religion." All these were novel ideas in that generation and peculiarly hateful to Pastor Goeze of Hamburg, who led a numerous band of obscurantists, while at first Lessing was almost the only defender of free discussion. Lessing's letters in this controversy are remarkable for their eloquence, wit, satiric power, and dramatic vivacity. They mark a distinct advance in German prose style and a permanent gain to the religious life of the German nation. And out of the bitterness of the dispute came as a sweet fruit the dispassionate expression of its results in the dramatic poem of toleration, *Nathan the Wise*, inspired by his friendship for Moses Mendelssohn.

The same lofty theme was pursued during Lessing's closing years in *Die Erziehung des Menschengeschlechts*, the work on education cited above; and its principles appear in the political sphere in *Ernst und Falk, Gespräche für Friemaurer* (1788), whose bold utterance was muzzled by the Brunswick censor. Lessing in these last days wrote as one to whom hard experience had taught its lesson of self-denying wisdom. His mind was still active and eager, but his body was gradually giving way. On a visit to Brunswick he broke down utterly, and died after a brief illness, February 15, 1781.

Lessing, says Goethe, was great by character and tenacity of will. Critical distinctions are his strongest side. By them he restored a national drama to Germany, gave his nation true canons of æsthetic and dramatic criticism, freed her from a petrified orthodoxy, and taught her to breathe a more tolerant and loftier Christianity, giving to all her sons the example of a life devoted to the search for truth.

Lessing's *Works* have been often collected, notably by Lachmann (13 vols., 1838-40). Most of them are published separately. There are translations of the *Laokoon, Minna von Barnhelm, Emilia Galotti,* and *Nathan der Weise.* Consult: Danzel and Guhrauer, *Lessing, sein Leben und Seine Werke* (Leipzig, 1850-54); Erich Schmidt, *Lessing* (Berlin, 1899); Fischer, *G. E. Lessing, als Reformator der deutschen Litteratur* (Stuttgart, 1881); Düntzer, *Erläuterungen zu Lessings Werken* (Leipzig, 1883); Spicker, *Lessings Weltanschauung* (ib., 1883); Braun, *Lessing im Urteile seiner Zeitgenossen* (Berlin, 1884-97); Kort, *Lessing et l'antiquité* (Paris, 1894); Consentius, *Lessing und die Vossische Zeitung* (Leipzig, 1900); Blumner, *Lessings Laokoon* (Berlin, 1879); Schröter und Thiele, *Lessings Hamburgische Dramaturgie* (Halle, 1877); Strauss, *Nathan der Weise* (Berlin, 1866); Pabst, *Vorlesungen über Nathan der Weise* (Bern, 1881). There are English *Lives* by Sime (London, 1877), Zimmern (ib., 1878), and Rolleston (ib., 1889).

LESSING, Karl Friedrich (1808-80). A German historical and landscape painter, grandnephew of Gotthold Ephraim Lessing. He was born near Breslau, February 15, 1808, and was a pupil of the Berlin Academy. He first devoted himself to landscape, and in 1826 obtained a prize with his "Cemetery in Ruins." He accompanied his master, Schadow, to Düsseldorf, where he continued his studies, devoting himself to historical paintings. In 1830, when Schadow went to Italy, Lessing occupied his place as director of the Academy, exercising great influence upon the Düsseldorf school. His picture "Das trauernde Königspaar" ("Mourning Royal Couple") brought him great popularity. In 1837 he received a gold medal at Paris; he was a member of the Berlin Academy, and was the recipient of several orders. In 1858 he was appointed director of the gallery at Karlsruhe, where he continued his activity as a painter until his death, January 4, 1880. His historical paintings were mostly executed in the service of Protestantism. The best known are: "Hussite Sermon" (1836), and the "Martyrdom of Huss" (1850), in the National Gallery at Berlin; "Huss Before the Council of Constance" (1842), in the Museum of Frankfort; "Dispute Between Luther and Dr. Eck," in the Gallery of Karlsruhe; "Luther Burning the Pope's Bull" (1853); "Pope Paschal II., a Prisoner of Henry V." (1857), in the possession of the German Emperor. As a landscape painter Lessing occupies an important place, being the chief master of the Romantic School in Germany. His landscapes were chiefly mountain scenery, painted directly from nature, only the figures being reminiscent of Romanticism. Consult M. Jordan, *Ausstellung der Werke Karl Friedrich Lessings* (Berlin, 1880).

LESSON (OF., Fr. *leçon*, It. *lezione*, from Lat. *lectio*, reading, lesson, from *legere*, to read, Gk. *λέγειν*, *legein*, to say). In the liturgical sense, a portion of the Church service appointed to be read, chiefly with a view to instruction and exhortation, as distinguished from prayer and praise addressed to God. In this sense it includes the epistle and gospel (qq.v.), but the term is more commonly applied to the selections read in the ancient breviary office of matins and in the morning and evening prayer of the Anglican churches. The earliest notices we have of services of the first Christians describe them as maintaining a practice which had been traditional for centuries in the Jewish synagogues. Besides what we now know as the Old and New Testaments, the letters of various bishops, especially those of Saint Clement, the *Shepherd* of Hermas, and other edifying writings were read. When the canon of Scripture came to be definitely fixed, the reading during divine service was usually restricted to it. At first books were read continuously from beginning to end; but with the gradual development of the liturgical year selections were made in order to have the reading appropriate to the mystery or event commemorated. The arrangement of this order is commonly attributed to Saint Jerome.

The lessons in the breviary (q.v.) for matins on Sundays and greater festivals are nine—the first three from Scripture, the next three usually from the lives of the saints or some historical matter, and the last from a homily of one of the fathers on the gospel for the day. On smaller festivals and ordinary week-days only three are read. Some monastic rites have four lessons in each nocturne. In the Anglican Prayer-Book two lessons, much longer than those in the breviary, and of course in English, are appointed for morning and for evening prayer on each Sunday, festival, or week-day; the first is always taken from the Old Testament, and the second from the New.

LESSON, lĕ'sôɴ', René Primevère (1794-1849). A French naturalist, born at Rochefort. He was largely self-educated, save for a medical course at Rochefort, which fitted him for ship's surgeon; and was on board the *Regulus* when it was burned at Bordeaux by the British. He was director of the botanical gardens at Rochefort in 1822, when he was ordered on board the *Coquille* for her famous voyage around the world. With Garnot and Guérin he wrote *Voyage autour du monde sur la corvette La Coquille* (1830); and alone published supplements to Buffon (1828, 1835-41), a popular description of the cruise of *La Coquille* (1838), and many works on zoölogy and natural history, especially as relating to medicine.

LESSON IN ANATOMY, or School of Anatomy, The. A celebrated painting by Rembrandt, painted in 1632 for the Amsterdam Guild of Surgeons, and now in the museum of The Hague, Holland. The renowned anatomist Nikolaas Tulp is represented dissecting an arm of a corpse lying on a table before him. The audience consists of seven persons, two of them members of the Guild of Surgeons.

LES'TER, Charles Edwards (1815-90). An American author, born at Griswold, Conn., a descendant of Jonathan Edwards. He was of a roving disposition and traveled widely in the United States and Europe. He was admitted to the bar in Mississippi and later was ordained a minister in the Presbyterian Church. In 1840 he addressed anti-slavery meetings in Massachusetts, and was elected a delegate to the London anti-slavery conference of that year. He did not return to the United States after the close of the conference, but remained in England, where he published a book entitled ***The Glory and Shame***

of England (1841), in which he criticised England's anti-slavery professions. In 1842 President Tyler appointed him United States Consul at Genoa, and in the five years during which he occupied this position he translated a number of standard Italian authors into English and wrote *The Life of Vespucius* (1846), and *The Artist, the Merchant, and the Statesman of the Age of the Medici and of Our Own Times* (2 vols., 1846). During the following years he published a number of other works, including: *My Consulship* (2 vols., 1853); *The Napoleon Dynasty* (1860); *America's Advancement, or the Progress of the United States During Their First Century* (1876); *The Mexican Republic* (1878); and a *Life of Charles Sumner* (1874). His books had considerable influence in their day.

LESTOCQ, le'stôk', Jean Hermann (1692-1767). A French surgeon and adventurer, who spent much of his life at the Russian Court. He chose the profession of a surgeon, and, after acquiring his education, went to Russia, where he received an appointment in the service of Peter the Great. In 1718, however, he was banished to Kazan on account of his dissolute habits. Recalled by Catharine I. (1725), he was appointed surgeon to Princess Elizabeth, and soon acquired such influence over her that he succeeded in persuading her to engage in the Revolution of 1741, by which she became Empress of Russia. In 1748, however, his enemies led the Empress to suspect his loyalty, and he was arrested, tortured, and banished to Ustjuk Veliki, in the Province of Archangel. He was recalled by Peter III. in 1761, and Catharine II. gave him a large annual pension and an estate in Livonia.

LESTRANGE, le-strānj', Sir Roger (1616-1704). An English journalist and translator, born at Hunstanton, Norfolk, December 17, 1616. He was probably educated at Cambridge. Being a zealous Royalist, he accompanied Charles I. in his expedition against the Scotch in 1639. In 1644 he was appointed by the King Governor of Lynn, and he attempted to take it from the Parliamentary forces, but, betrayed by two of his accomplices, he was tried, doomed to death as a traitor, and sent to Newgate. After four years he escaped and tried to incite an insurrection in Kent, but, failing, he fled to the Continent. After the passage of the Act of Indemnity (1652) he returned to England (1653) and made personal application to Cromwell, and was allowed to remain undisturbed. After the Restoration he was appointed by Charles II. censor or licenser of the press. In the *Public Intelligencer*, a newspaper which he started in 1663, he slavishly supported the Crown. The *Observator*, begun in 1681, two years after the Popish plot, as the organ of the Tory Party, aimed to defend the King from the charge of favoring Popery. In 1685 Lestrange was knighted by James II. for 'his unshaken loyalty to the Crown,' and elected to Parliament. In 1688 he was deprived of his office of censor and committed to prison for a short time. He died December 11, 1704. In the history of journalism Lestrange occupied a considerable place. His political pamphlets, coarse and brutal in style, hit hard. Among his translations, which have often been praised, are the following: Josephus; Cicero's *Offices;* Seneca's *Morals;* Erasmus's *Colloquies; Æsop's Fables;* Quevedo's *Visions;* Bona's *Guide to Eternity; Five Love-Letters from a Nun to a Cavalier.*

LESUEUR, le-sṳ'ẽr', Charles Alexandre (1778-1857). A French naturalist, born at Havre. He made his first success with his drawings illustrating the zoölogical discoveries of the expedition undertaken by the corvette *La Géographie.* With Péron, he published and illustrated valuable monographs on *Radiaires de la classe des méduses* and *Mollusques ptéropodes.* In 1815 he went to America with Maclaure and lived for some time in Philadelphia, where he contributed to the memoirs of the Academy of Natural Sciences. He returned to Havre in 1844 and became keeper of the city's museum.

LESUEUR, Eustache (1617-55). A French historical painter. He was born in Paris, and studied in the atelier of Simon Vouet, where Lebrun was his fellow pupil. One of his early works, "Saint Paul Healing the Sick," was painted for the Academy of Saint Luke. He was among the first members of the Académie Royale de Peinture et de Sculpture, established in 1648, and the only rival of Lebrun, its founder. During his early years Lesueur was occupied with miscellaneous designing, but he soon achieved a reputation, and was afterwards employed constantly in decorative works. In 1645-48 he executed a series of twenty-two notable pictures from the life of Saint Bruno, for the Chartreuse monks in Paris. They are now in the Louvre. Another important work of Lesueur's was the decoration of three salons in the Hôtel Lambert de Thorigny, with mythological subjects. He was called 'the French Raphael,' from the purity and grace of his conceptions. In the religious pictures painted by him for Paris churches he shows genuine devotional feeling, but he is never a satisfactory colorist. In many of his works he was assisted by his brothers Pierre, Philippe, and Antoine, and his brother-in-law Goussé.

LESUEUR, Jean Baptiste Cicéron (1794-1883). A French architect, born at Clairefontaine (Seine-et-Oise). He was a pupil of Percier, studied at the Ecole des Beaux-Arts, and won the Prix de Rome in 1819. He became a member of the Institute in 1846, and professor at the Ecole in 1853. His principal work, in which he was associated with Godde, was the extension of the Hotel de Ville of Paris in 1835-54. He also built the Conservatory of Music in Geneva, Switzerland. His publications on architecture include: *Vues des monuments antiques de Rome,* with Alaux (1827); *Architecture italienne ou palais, maisons et autres édifices de l'Italie moderne,* with Callet (1829); and *Chronologie des rois d'Egypte* (1848-50), crowned by the Academy.

LE SUEUR, Jean François (1760-1837). A French composer, born at Drucat-Plessiel, near Abbeville. As a child he was chorister at Abbeville, and when fourteen was sent to college at Amiens. In 1779 he left there to become music-master at the Sées Cathedral, and a little later went to Paris, where he was made assistant master at the Church of the Innocents. While there he received from the Abbé Roze his sole musical instruction. In 1781 he accepted the post of music-master at the Cathedral of Dijon, and from there went to Le Mans (1783), and subsequently to Tours. In 1784 he returned to Paris, and two years later won in competition the musical directorship of Notre Dame. He inaugurated radical reforms, using a large orchestra, and even preluding a mass with an overture. His methods, although popular, aroused bitter opposition, and in 1788 he retired for four years to the country, where he devoted himself to composition. In 1793 he produced in Paris an opera, *La Caverne*, followed the next year by *Paul et Virginie* and *Télémaque*. He was appointed inspector at the Conservatory (1795), but in 1802 lost his position owing to a bitter altercation over the rejection, by the Grand Opéra, of two of his operas. In 1804 he obtained the highest musical honor in France, being chosen Paisiello's successor as maître de chapelle to Napoleon. His two rejected operas, *Les Bardes* and *La Mort d'Adam*, were now produced; he succeeded Grétry at the Institut (1813); became superintendent and composer of the chapel of King Louis XVIII., and in 1818 professor of composition at the Conservatory. He died in Paris. Le Sueur was a brilliant teacher, and twelve of his pupils won the Prix de Rome. As a composer he ranked high, his principal characteristics being a grand simplicity—a quality bequeathed to his pupil Gounod—and the marvelous harmonic skill which his pupil and admirer Berlioz carried to its ultimate excellence. His hobby was ancient Greek music, and he wrote *Notice sur la mélopée, la rhythmopée et les grands caractères de la musique ancienne* (Paris, 1793). With the exception of the operas already mentioned, his compositions were almost wholly sacred, and include the oratorios *Déborah, Rachel, Ruth et Noémi, Ruth et Boaz;* three *Te Deums; Stabat Mater;* masses, etc. Consult: Stephen de la Madeleine, *Biographie de J. F. Le Sueur* (Paris, 1841); Fouqué, *Le Sueur comme prédecesseur de Berlioz* (Paris, 1882).

LESZCZYNSKI, lĕsh-chụn'skē, STANISLAS. See STANISLAS I. LESZCZYNSKI.

L'ÉTAT CEST MOI, lā'tā' sā mwä (Fr., I am the State). An expression put into the mouth of Louis XIV., and intended to epitomize that monarch's system of absolutism. Various origins are assigned for the phrase. Louis is said to have uttered it in the Parliament of Paris, in 1655, in response to a statement of the president, when he was asked to convoke the States-General, or to a judge who used the words 'King and State.'

LETCH'ER, JOHN (1813-84). An American politician, Governor of Virginia during the Civil War. He was born in Lexington, Va.; received a university education, and began the practice of law in 1839. In 1850 he was elected a delegate to the Virginia Constitutional Convention, and afterwards sat in Congress during the stormy times preceding the outbreak of the Civil War. He was elected Governor of Virginia in 1859, and opposed the secession ordinance, but, seeing the hopelessness of maintaining that attitude, turned over the State militia and munitions of war to the Confederate leaders.

LETHE, lē'thē (Lat., from Gk. Λήθη). The stream of oblivion in the lower world, from which, according to the ancient Greek belief, the souls of the departed drank, to lose all recollection of earthly existence, before passing into the Elysian Fields.

LETH'BRIDGE. A town of South Alberta, Northwest Territories, Canada, on the Canadian Pacific Railway, and on the Belly River, 107 miles southeast of Calgary. It has important coal-mining industries, which supply the country between Winnipeg and Lake Superior. Population, in 1891, 2200; in 1901, 2279.

LETRONNE, le-trôn', JEAN ANTOINE (1787-1848). A French archæologist and historian. He was born and was educated in Paris; traveled in Italy, Switzerland, and Holland (1810-12); and for his *Essai sur la topographie de Syracuse* (1813) and *Recherches sur les fragments d'Héron d'Alexandrie* (written in 1816 and printed 1851), was elected to the Academy of Inscriptions. He became professor of history and archæology in the Collège de France in 1831, head of the Royal Library in the same year, and in 1840 inspector-general of the archives of France. His most important work was *Recueil des inscriptions grecques et latines de l'Egypte* (1842-48, completed by Brunet de Presle). His other works on archæology, especially inscriptions and numismatics, include: *La peinture murale chez les Grecs et les Romains* (1835-37); *Considérations sur l'évaluation des monnaies grecques et romaines* (1817); and *Fragments de Scymnus de Chio et du faux Dicéarque* (1840); and, on history, *Matériaux pour servir à l'histoire du christianisme* (1833).

LETTE, lĕ'te, WILHELM ADOLF (1799-1868). A Prussian politician and economic reformer, born in Kienitz, and educated at the Universities of Heidelberg, Göttingen, and Berlin. Participation in 'demagogic' disturbances resulted in his imprisonment and exclusion from State employ; but neither was of long duration. In 1840 he was made director of the Prussian agricultural bureau on Frankfort-on-the-Order, and three years later received the appointment of counselor to the Ministry of Interior for agricultural matters. In 1845 he became president of the Court of Errors for agricultural affairs. His interest in the welfare of the people was shown by his establishing many associations; for example, the *Centralverein für das Wohl der arbeitenden Classen*, and the *Berliner Handwerkerverein*. In 1851 he was a member of the first Prussian Chamber, and a year afterwards took a seat in the other House, which he kept until his death. His more important writings are: *Die Landeskulturgesetzgebung des preussischen Staats* (with Rönne, 1853-54); and *Die Verteilung des Grundeigentums im Zusammenhang mit der Geschichte, der Gesetzgebung und den Volkszuständen* (1858).

LETTER (OF., Fr. *lettre*, from Lat. *littera, litera,* letter). An authoritative writing empowering the person to whom it is issued to exercise a certain office, perform a duty, or do any other act which, but for such authorization, could not have been lawfully performed. They are issued for many purposes and under a great variety of circumstances. *Letter of attorney,* or power of attorney, is a writing or deed authorizing an agent (whether he is a certificated attorney or not) to do any lawful act in the stead of the party executing it. *Letter of exculpation,* in Scotch criminal law, is a warrant obtained by a prisoner to summon witnesses on his behalf at his trial. *Letter missive,* in England, is an order from the Lord Chancellor to a peer requesting the latter to enter an appearance to a bill filed in chancery against such peer; in Scotland the word means any written agreement or memorandum relative to some bargain as to mercantile matters, or as to the sale of land or houses or the letting of land. *Letter of request*, in English ecclesiastical law, means a writ which commences a suit in the Court of Arches against a clergyman, instead of proceeding, in the first instance, in the consistory court. *Letter of safe conduct* means a writ, under the great seal, to the subject of a State at war with any country, authorizing and protecting such subject, while dealing or traveling in that country, so that neither he nor his goods may be seized, as they otherwise might be. *Letter testamentary* is an instrument issued by a judge who has jurisdiction of probate matters, declaring that a certain will has been admitted to probate, and giving the executor power to administer the estate. Such an instrument granted to the administrator of a person dying intestate is called a *letter of administration*. See Letters Patent; Letters Rogatory; Administration; Executor.

LETTER-CARRIERS, National Association of. An association organized at Milwaukee in 1889, and subsequently incorporated under the laws of Tennessee, with the object of uniting all the letter-carriers of the United States in a fraternal society, securing to them their "rights as Government employees," improving the postal service in conjunction with the Post Office Department, and establishing the Letter-Carriers' Mutual Benefit Association, and the Letter-Carriers' Retirement Association. The National Association at one time took an active part in the Knights of Labor—withdrawing, however, after a bitter contest. It has been charged with excessive political activity directed toward the election of Congressmen favorable to its interests; but its principal function is the maintenance of the Mutual Benefit Association, an auxiliary society with separate officers and organization, but under the general control of the National Association. In 1902 the Mutual Benefit Association had 4525 members and expended $54,000 in insurance benefits. The Retirement Association has not yet been formed. At the end of 1902 the National Association had about 900 branches and 15,117 members. The official organ is the *Postal Record*, published monthly at Washington, D. C.

LETTER OF CREDIT. See Credit, Letter of.

LETTERS. The characters of written speech. Letters are therefore the components of the alphabet (q.v.). They are quite inadequate to represent the sounds for which they stand, although there have been repeated attempts to make a system of letters which would answer the requirements of phonetics (q.v.). In these so-called phonetic alphabets, as well as in the transcription of alphabets which differ in a marked degree from the Roman script, as Russian, Armenian, Hebrew, Chinese, and many others, it is both customary and necessary to associate various diacritical marks with the Roman letters to approximate their phonetic value in the foreign alphabets in question.

LETTERS, Proportionate Use of. The following tables represent the conclusions based on the experience of printers, with regard to the relative frequency of use of the letters of the alphabet in English composition. The first table exhibits the general use:

E	1,000	M	272
T	770	F	236
A	728	W	190
I	704	Y	184
S	680	P	168
O	672	G	168
N	670	V	158
H	540	B	120
R	528	K	88
D	392	J	55
L	360	Q	50
U	296	X	46
C	280	Z	22

The proportion of their use as initial letters is as follows:

S	1,194	R	291
C	937	W	282
P	804	G	266
A	574	U	228
T	571	O	206
D	505	V	172
B	463	N	158
M	430	J	69
F	388	Q	58
I	377	K	47
E	340	Y	23
H	308	Z	18
L	298	X	4

LETTERS IN LITERATURE. The letter belongs to the most personal branches of literature, represented also by the journal and the confession.

Letters were not unknown in ancient Greece, where they circulated mainly between philosophers and their disciples. Among the writers were Socrates, Plato, Aristotle, Demosthenes, and Isocrates. At a later period there came into vogue among the Greeks the purely fictitious letter embodying a character sketch or a brief satire on manners. Alciphron was particularly clever in these little pictures of contemporary life. But of the letters that have survived from antiquity, those of Cicero to Atticus and other friends make the widest appeal. Covering, as they do, the great civil war between Pompey and Cæsar, they are precious historical documents. Cicero himself is always present in his hopes and perplexities; and withal there is a sane reflection on conduct and the course of public affairs. It is perhaps not too much to say that the letter as a literary species, with its own style and form, dates from Cicero. After Cicero the next most notable collection, in order of time, is the series of 124 letters from Seneca to Lucilius. Seneca's letters are, however, rather moral observations and aphorisms put into epistolary form. The letters of the younger Pliny likewise rank high as literature. Besides details in the life of the rich and genial author, they also contain interesting facts concerning the treatment of Christians. Among later Roman letter-writers whose work has great historical, if not literary, interest, were Symmachus and Cassiodorus. From the Romans comes, too, the verse epistle, in which the poet addresses his patron or friend on private or public events, often with a satirical intent. Of this art Horace was the ancient master.

The early fathers of the Church left a large body of theological correspondence. Particularly prized are the letters of Gregory Nazianzen, Basil, Chrysostom, Ambrose, Augustine, Jerome, Zosimus, Leo I., and Gregory I. In the letters of Héloïse to Abélard (twelfth century) there was displayed an intense love passion, the counterpart in real life of the great romance of *Tristan and Iseult*. All through the Renaissance period, when classical ideals played havoc with mediæval notions, letters in Latin were numerous. For Italy there are the famous epistles of Dante and Petrarch; and for Germany, the theological and controversial epistles of Reuchlin, Melanchthon, Erasmus, and Pipsius. A most remarkable collection is the *Epistolæ Obscurorum Virorum* (2 parts, 1515-17), in which Reuchlin's friends Crotus Rubianus and Ulrich von Hutten satirized in comic Latin the ignorance and stupidity of the monks. Though not a very noble defense of classical learning, this vulgar satire was effective in paving the way to a new age.

English literature is extremely rich in letters. At the very threshold of modern times are the *Paston Letters*, which passed between members of a Norfolk family and their friends from the beginning of the reign of Henry VI. on into the reign of Henry VII. The correspondence presents a vivid picture of social life at the dawn of the English Renaissance. The Eton boy writes to his 'right and reverent and worshipful brother' for money and clothes; and mingled with public and private incidents detailed by the elders are references to Latin manuscripts and translations passing from hand to hand. Less sincere, but of finer literary quality, are the letters of James Howell, published in installments under the title *Epistolæ Ho-elianæ; Familiar Letters* (1645-47-50-55). The best of them, abounding in shrewd observation and humorous anecdote, are written with a graceful pen. Long considered genuine, it now seems that they were mostly literary exercises put into epistolary form. Howell's success led at once to fictitious collections by Robert Loveday and Margaret, Duchess of Newcastle. By 1740 imaginary letters on a great variety of topics were much sought by publishers. It was at this time that Samuel Richardson, when asked to write such a collection, wove into the correspondence the story *Pamela*, and thus transformed a bundle of letters into the novel of manners.

In the meantime letters were passing between real men and women. The correspondence between Sir William Temple and Dorothy Osborne, his future wife, records a tender attachment. A little later, Temple's amanuensis, afterwards Dean Swift, was sending his charming prattle to Stella; but her letters in reply were destroyed by the great Dean. Swift also kept up a correspondence with Arbuthnot, Bolingbroke, and Pope, and wrote those 'masterpieces of dreadful humor' called the *Drapier's Letters*. Pope's own correspondence with his friends, presenting the poet as he wished to appear to the world, is a good example of an autobiography in letter form. One of Pope's correspondents was Lady Mary Wortley Montagu, whose letters, covering nearly fifty years, were published after her death. As vivacious comments upon contemporary life, social and literary, they are among the best that have ever come from women. Individual letters of Dr. Johnson, as the repudiation of Lord Chesterfield, are celebrated. Chesterfield's letters to his natural son, forming a cyclopædia of polite manners, created a great stir in their time, and are still read for their natural grace and good breeding. In the *Citizen of the World*, Goldsmith turned an imaginary correspondence into a light satire of contemporary manners. Many imitators followed down to the time of Robert Southey. The political satire in letter form attained its greatest popularity in the *Letters of Junius* (q.v.). The finest personal letters of the eighteenth century came from Walpole, who wrote with abandon, giving loose rein to anecdote, gossip, scandal, and playful cynicism. Gray's letters, tender, affectionate, and lighted here and there with gleams of exquisite humor, are perfect in tone and temper. In style Cowper stands midway. His letters, written without revision or erasure, are the spontaneous expression of a tender and humorous nature softened by melancholy. Among other names of the eighteenth century that should not be forgotten are Addison, Sterne, Frances Burney, Mary Wollstonecraft, Hannah More, and Burns.

During the last century the literature of letters became vast. The death of any author of repute is now sure to be followed by the publication of his correspondence, which serves as an autobiography for the whole or a part of his career. Particularly interesting was the fairly successful attempt to tell the story of George Eliot's life by a chronological arrangement of her letters with slight connecting links from the pen of her husband. Though the novel in letter form has lost its prestige, the fictitious correspondence, usually depicting a love-passion, has retained its vogue. Of genuine letters addressed from friend to friend, the choicest since Cowper are by Byron and Charles Lamb. The letters of Edward FitzGerald, addressed to some of the most eminent men of his time, are also models of ease and frankness. Public curiosity has led to the publication of the love-letters of literary men. The two most notable examples are the letters of Keats to Fanny Brawne and the correspondence between Browning and Miss Barrett just before their marriage. Great interest also attaches to the correspondence of Scott, Southey, De Quincey, Leigh Hunt, Sydney Smith, Lockhart, Hood, Macaulay, Emerson, Carlyle, Mrs. Carlyle, Thackeray, Ruskin, Matthew Arnold, Stevenson, Lowell, and T. E. Brown.

It has generally been conceded that the French excel all other nations in the art of letter-writing. And certainly if one were called upon to select the most charming letter-writer of modern times, the lot would fall to Madame de Sévigné, a member of the celebrated Hôtel de Rambouillet. She was a part of the best Parisian society for more than forty years. Her daughter married the Count de Grignan and settled in Provence. This separation was the occasion of the famous correspondence, never intended for publication, describing with extraordinary art and *esprit* the life of the capital. To the same period belong the letters of Madame de Maintenon, Guy Patin, and Racine. The theological letter received its highest style from Pascal in the *Lettres à un provincial*. For the eighteenth century may be cited Madame du Deffand; Voltaire, who left many volumes of correspondence, including letters from England and letters to Frederick the Great; and Rousseau, who, besides numerous letters to his friends, wrote a novel in letter form. The classic traditions of the French letter were continued by Madame de Staël, Hugo, Saint-Beuve, George Sand, Alfred de Musset, the Goncourts, and Mérimée, whose intimate *Lettres à une inconnue* appeared after his death.

German letters do not impress a foreigner with those prime requisites to a good letter—ease and grace. On the other hand, the German usually has something worth saying. Best known outside of Germany are the letters of Luther to his friends and family, the correspondence between Goethe and Schiller, and the letters of Bismarck to his wife. No letters equal those between Goethe and Schiller for letting one into the secrets of great authorship. Each informs the other of what he is doing and, so far as he can, describes the method of procedure. Schiller's letters to Körner treat in part the same theme. Among other Germans who have left valuable letters are Lessing, Herder, Winckelmann, the brothers Humboldt, Richter, the Schlegels, Heine, the Grimms, and Richard Wagner.

Consult: Roberts, *History of Letter-writing from the Earliest Period to the Fifth Century* (London, 1843); Knight, *Half-hours with the Best Letter-Writers* (London, 1867); Holcombe, *Literature in Letters* (New York, 1866); and Scoones, *Four Centuries of English Letters* (London, 1880).

LETTERS OF MARQUE. See MARQUE, LETTERS OF.

LETTERS PATENT. An open letter under the seal of the Government granting some property, right, privilege, or title. It is literally an open letter addressed to the public, and intended to be evidence of the rights of its grantee. The term is usually now applied to: (a) An instrument issued from the Patent Office in the name of the Government, granting and confirming to an inventor the exclusive right and privilege to his invention; (b) less specifically, an instrument by which lands are granted by the government to individuals. See PATENT AND PATENT LAW.

LETTERS ROGATORY. A written instrument addressed by one court to another in a foreign jurisdiction, requesting the latter to cause to be examined, upon written interrogatories annexed, a witness, who is within the jurisdiction of the latter court. Letters rogatory are designed to accomplish the same purpose as a commission to take depositions. Letters rogatory are sent to foreign countries, as there is no 'comity of States' to rely on in such cases, and are quite common, especially in Admiralty proceedings. See DEPOSITIONS.

LETTERS TO DEAD AUTHORS. A series of critical essays by Andrew Lang (1886). The graceful, humorous epistolary form covers a just and discriminating criticism of ancient and modern authors, ranging from Theocritus to Dumas.

LETTERWOOD, or SNAKEWOOD. The heartwood of a rather rare British Guiana tree, Brossimum Aubletti, of the order Artocarpaceæ, the breadfruit family. It grows from 60 to 70 feet high, and acquires a diameter of from 2 to 3 feet. The sap-wood is white and hard; the harder and heavier heart-wood, which rarely exceeds 7 inches in thickness, is a rich brown, beautifully mottled with deeper shades of brown, almost black, spots, arranged with much greater regularity than is usually the case in the markings of wood, and bearing a slight resemblance to the thick letters of some old black-letter printing. In Guiana it is used for small articles of cabinet-work, and elsewhere only for fine veneer and inlaying work.

LETTIC LANGUAGE AND LITERATURE. The language and literature of the Letts (q.v.) living in the Russian governments of Courland, Livonia, Vitebsk, Kovno, and Pskov, and in East Prussia. With Lithuanian (q.v.) and Old Prussian (q.v.), Lettic forms the Baltic subdivision of the Indo-Germanic languages (q.v.). The mutual relation between Lettic and Lithuanian is approximately the same as between Old High German and Gothic. Only in a few points is Lettic the more archaic. It has preserved unchanged Indo-Germanic *s* and *z* where Lithuanian has modified them into *sz* (*sh*) and *ž*, and it retains the original short vowels where Lithuanian shows long vowels of later development. The imperative is identical with the second person indicative, while Lithuanian has developed a new form with *k* as the characteristic sign. On the other hand, Lettic has lost the pure *o* sound, and has lost the nasal *n* (as, Lithuanian *rankà*, Old Church Slavic *rąka*, Lettic *rů̀ka*, Russian *ruka*, 'hand;' Lithuanian *linkti*, Lettic *likt*, 'to bend'). Usually the vowels in final syllables are dropped, as Lettic *růkás*, Lithuanian *rañkosu*, locative plural of *rankà*, 'hand;' Lettic *likt*, Lithuanian *linkti*, 'to bend.' Morphologically, Lettic, like the Romance languages, possesses only two genders, the neuter (in pronouns and adjectives) being replaced by the masculine. The dual has disappeared entirely, except in *diwi*, two, and *abbi*, both. Of the eight Indo-Germanic cases, the ablative is lost, and the nominative generally performs the functions of the vocative, while the instrumental is usually identical with the accusative in the singular and with the dative in the plural. The verb, which is divided into twelve classes, has only three simple tenses (present, preterite, and future), and three simple moods, indicative, conditional, and imperative, beside an infinitive stem and a supine in *tu*. It has an active and a reflexive, formed by adding *-s*=*sewi*, 'self,' as well as a passive voice, and six participles, four active (two present, one preterite, and one future), and two passive (present and preterite). The number of periphrastic forms is extremely large. As in Czech, the accent came to be fixed invariably on the first syllable. In its vocabulary, Lettic exhibits the influence of German, Russian, Esthonian, Livonian, Finnish, and Scandinavian, and three groups of dialects are distinguished: High Lettic, in the East; Low Lettic, or Tahmian, in Northwestern Courland; and Middle Lettic, on which the literary language is based.

The earliest literary monuments in Lettic are a translation of Luther's *Catechism* (printed in Königsberg, 1586), *Undeutsche Psalmen*, and *Gesänge* (ib., 1587), a Lettic version of psalms and hymns. Nearly all the works up to the time of G. F. Stender (1714-96) were of a religious character. Stender compiled an exhaustive dictionary and wrote a grammar which marked an epoch in the history of Lettic. He also composed stories and tales, and a *Book of Wisdom Concerning the Universe and Nature* (1776), containing elements of astronomy, geography, and history, as well as odes and songs. The period 1750-1820 is marked by the birth of national consciousness. To promote it further, periodicals were started, of which the *Magazin*, the organ of the Lettic Literary Association of Mitau since 1827, has been the most important. The decades 1860-80 were the culminating years of this nationalism in literature, with Woldemar at the head of the 'Young Lettic' group, mostly educated in Russian universities.

They endeavored to rid themselves of the all-pervading German influences; they translated the European and Russian classics, and published periodicals wherein the whole economic, social, and intellectual life of the Letts was discussed with a view to betterment. The last two decades of the nineteenth century were characterized by striving to gain independence from foreign ideals. The best authors of the period were: Jur Allunan, a lyric poet and editor of the almanac *Home, Nature, and Universe;* Kroghen (pseud. Ausaklis); the brothers Kaudsit; Pumpurs; Treuland-Brihwsemneeks; and the lyric poet Lautenbach (pseud. Jusminis; professor at Dorpat). The best-known names of the day are: Rosenberg-Aspasia; Apsit; Blauman; Steperman, the author of historical dramas; the critics Theodor and Janson; and the fertile Martin Lap, a ballad-writer and translator of great gifts. In 1896 the works existing in Lettic numbered 2027, besides ten periodicals. The Lettic folk-literature is enormous, especially in the line of proverbs, riddles, tales, and songs.

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LETTRES DE CACHET, lĕ′tr′ de kȧ′shȧ′ (Fr., letters of seal). The name given to the warrants of imprisonment issued by the kings of France before the Revolution. They were written on ordinary paper, signed by the King and countersigned by one of the secretaries of State and sealed with the King's little seal (cachet). They differed from the *lettres patentes* or formal letters of authorization, which were open, signed by the King, countersigned by a Minister, and bore the great seal of State. *Lettres patentes* required to be registered by the Parlements; but *lettres de cachet*, as the expression of the King's will in matters presumably private, were exempt from the jurisdiction of the Parlements. By the *lettres de cachet* the royal pleasure was made known to individuals or to corporations, and the administration of justice was often interfered with. The use of *lettres de cachet* began in the fourteenth century, but became especially frequent after the accession of Louis XIV. It was very common for persons to be arrested upon such warrants and confined in the Bastille (q.v.), or some other State prison, where many of them remained for a very long time, and some for life, either because it was so intended, or in other cases because they were forgotten. The lieutenant-general of police kept forms of *lettres de cachet* ready, in which it was only necessary to insert the name of the individual to be arrested. Sometimes an arrest by *lettres de cachet* was resorted to in order to shield criminals from justice. *Lettres de cachet* were issued in great numbers after the revocation of the Edict of Nantes (1685) for the purpose of breaking up Protestant households. Their use declined under the Regency, but during the early part of the reign of Louis XIV. they were employed by the Jesuits as a powerful weapon of persuasion—80,000 *lettres de cachet* being issued, it is stated, during the Ministry of Cardinal Fleury. In the course of time the abuse of the *lettres de cachet* became notorious. A regular traffic in them was carried on by the King's mistresses, and for the sum of twenty-five louis d'or any man might rid himself of his enemy with secrecy and expedition. The Parlement frequently protested against the criminal misuse of the *lettres de cachet*, and their suppression was universally demanded on the eve of the Revolution. They were abolished by the National Assembly January 15, 1790.

LETTRES DE FEMMES, de fȧm (Fr., letters of women). A collection of graceful, but often indecent, tales by Marcel Prévost (1892). The volume was very popular and was followed in 1894 by *Nouvelles lettres de femmes*, and in 1897 by *Dernières lettres de femmes.*

LETTRES DE MON MOULIN, de mōɴ mo͞o′lăɴ′ (Fr., stories from my mill). A series of stories by Alphonse Daudet (1869) purporting to have been written in a windmill in Provence in which the author had taken up his residence. The tales first appeared in *L'Evénement* over the signature Gaston-Marie.

LETTRES PERSANES, pĕr′sȧn′ (Fr., Persian letters). A criticism and satire on French affairs by Montesquieu, published anonymously at Amsterdam in 1721. The work purports to be the views of two Persians, Usbeck and Rica, traveling in Europe, as given in letters to their friends. The criticisms are directed against a large number of French political, religious, moral, and social weaknesses.

LETTRES PROVINCIALES, prō′văɴ′sē′ăl′. See PASCAL.

LETTS. A branch of the Letto-Lithuanian group of the Aryan family, living in the Russian governments of Courland, Livonia, Vitebsk, Kovno, and Pskov, and in East Prussia. They differ little in physical appearance from the Lithuanians, but are less modified by German, Finnish, and other peoples, and they retained some of their pagan customs down into the eighteenth century. The Letts are estimated to number about 1,350,000. They are mostly Protestants. See LETTIC LANGUAGE AND LITERATURE.

LETTUCE (OF. *letuce*, *laitue*, *letue*, Fr. *laitue*, from Lat. *lactuca*, lettuce, from *lac*, milk), *Lactuca*. A genus of plants belonging to the natural order Compositæ. The garden lettuce (*Lactuca scariola* or *Lactuca sativa*) is supposed to be a native of the East Indies, but is not known to exist anywhere in a wild state. From remote antiquity it has been cultivated in Europe as an esculent, and particularly as a salad. It has a leafy stem, oblong leaves, a spreading, flat-topped panicle, somewhat resembling a corymb, with yellow flowers, and a fruit without margin. It is now generally cultivated in all parts of the world where the climate admits of it. The many varieties are divided into two groups: cos (or romaine) and cabbage lettuce, the former having the leaves more oblong and upright, requiring to be tied together for blanching; the latter with rounded leaves, which spread out near the ground. Lettuce is generally eaten raw, with vinegar and oil, more rarely as a boiled vegetable. When grown in gardens the seed is planted in rich, loose soil as early in the spring as the ground can be worked. Market gardeners grow the seedling plants in the greenhouse or hot-bed and transplant 8-12 inches apart in the open field after the plants have been well hardened off. The forcing of lettuce in greenhouses has been an important industry in the vicinity of large cities in the Northern and Eastern United States. The other species of this genus exhibit nothing of the bland quality of the garden lettuce. The strong-scented lettuce (*Lactuca virosa*) is distinguished by the prickly keel of the leaves and by a black, smooth seed, with a rather broad margin.

Lettuce Diseases. Lettuce, especially when forced or grown under glass, is liable to one or two serious fungous troubles. The most serious is known as 'rot' or 'drop,' which is due to attacks of *Botrytis vulgaris*. The presence of the fungus may be noted by a dark-colored decayed spot on the stem near the ground. Since the fungus is a soil growth, steaming the soil before planting in the benches is recommended. A temperature of 175 to 200 degrees is deemed sufficient if continued for an hour or more. Lettuce will grow at a temperature below that required for the development of the fungus—a fact of which advantage may be taken. A mildew (*Bremia lactucæ*) attacks lettuce in the same condition as the rot. Care in ventilation will to a great degree control this disease. A rust due to *Puccinia prenanthis* and a leaf-spot caused by *Septoria consimilis* sometimes attack lettuce, but aside from temporary disfigurement seldom occasion much loss. See Plate of Salad Plants.

LETTUCE-BIRD. The American goldfinch (q.v.).

LEUBE, loi'be, Wilhelm (1842—). A German physician, specialist in diseases of the digestive organs. He was born at Ulm, and studied at Tübingen, Zurich, Berlin, and Munich. In 1868 he became clinical assistant at Erlangen, and in 1885 professor at Würzburg. Leube specialized in physiological chemistry; with Rosenthal prepared a 'digested food' (*Leubes Fleischsolution*); and wrote: *Ueber die Wirkung des Dünndarmsaftes* (1868); *Ueber die Ernährung vom Mastdarm aus* (1872); *Die Krankheiten des Magens und Darms* (2d ed. 1878); *Behandlung der Urämie* (1883); *Chemie in der Medizin* (1884); and *Spezielle Diagnose der innern Krankheiten* (1889-93).

LEUCA'DIA. One of the Ionian Islands. See Santa Maura.

LEUCHSENRING, loik'sen-rĭng, Franz Michael (1746-1827). A German man of letters, born at Langenkandel in Alsace. Leuchsenring was a friend of Jacobi, Herder, Goethe, and Wieland for a time, but they all broke with him, and Goethe portrayed him in no flattering colors in *Pater Brey*. He also describes him in *Dichtung und Wahrheit*. He was a sentimentalist, a member of the *Illuminatenorden*, and continually suggested among his friends the foundation of a secret order of sentimentality.

LEUCHTENBERG, loiK'ten-bĕrK. See Beauharnais.

LEUCIN, lū'sĭn (from Gk. *λευκός*, *leukos*, white; connected with Lat. *lux*, light, OIr. *lóche*, lightning, OChurch Slav. *luča*, ray, Skt. *ruc*, to shine, OHG. *lioht*, Ger. *Licht*, AS. *lēoht*, Eng. *light*), $C_6H_{13}NO_2$. An amido-caproic acid whose chemical constitution is represented by the formula $CH_3.CH_2CH_2CH_2CH(NH_2).COOH$. It may be obtained in the form of flat, glittering, white, odorless and tasteless crystals that are readily soluble in water and in alcohol, but practically insoluble in ether. Neutral aqueous solutions of leucin usually have the power of turning the plane of polarized light to the left; the addition of acids or of alkalies, however, renders the solution dextro-rotatory. The leucin obtained from certain sources has no rotatory power at all. The importance of leucin in physiological chemistry is very considerable. It is found normally in the liver, pancreas, spleen, thymus, thyroid and salivary glands, etc. In certain diseased conditions of the liver, leucin has been found in the urine. It is one of the characteristic products of the pancreatic digestion of proteids, and it is formed wherever proteids undergo putrefaction and whenever they are decomposed by acids or alkalies. According to some authors, it is largely by the transformation of leucin that urea is formed in the animal body; this has not, however, been sufficiently proved and is rather improbable. Leucin may be conveniently prepared from horn-shavings by prolonged boiling with moderately dilute sulphuric acid, neutralizing with barium hydroxide, filtering, removing the excess of barium added with a little sulphuric acid, again filtering, and evaporating the filtrate to a small volume; the leucin then crystallizes out together with some tyrosin, but as the latter is much less soluble than the former, it may be removed by several crystallizations from water.

LEUCIP'PUS (Lat., from Gk. Λεύκιππος, *Leukippos*). The founder of the atomistic school of Greek philosophy, and forerunner of Democritus (q.v.).

LEUCITE, lū'sīt (from Gk. *λευκός*, *leukos*, white). An aluminum and potassium silicate that crystallizes in the isometric system. It is translucent to opaque, with a vitreous lustre and a smoky gray color. Leucite occurs chiefly in volcanic formations, and the best-known localities are Vesuvius and Mount Somma in Italy, where it is disseminated in grains through the lava; also in the United States at various localities in Wyoming. Millstones of this leucite lava have been found in the excavations at Pompeii. The white varieties, which resemble the common garnet, are called *white garnet*.

LEUCKART, loi'kärt, Rudolf (1822-98). A German zoölogist, born in Helmstedt. He studied at Göttingen, and after teaching a few years there, he became, in 1850, professor of zoölogy at Giessen, and at Leipzig in 1870. His early contributions to science attracted much attention. He divided Cuvier's type 'Radiata' into Echinodermata and Cœlenterata, and otherwise improved the system of classification. He also called attention to the division of labor in various colonial animals. During the latter half of his life he devoted himself almost exclusively to the study of insects and parasitic worms, and became the greatest authority of his time on them. Of his numerous publications, the following are important: *Beiträge zur Kenntnis der wirbellosen Thiere* (with H. Frey, 1847); *Ueber Morphologie und Verwandtschaftsverhältnisse der wirbellosen Thiere* (1848); *Ueber Polymorphismus der Individuen oder die Erscheinungen der Arbeitsteilung in der Natur* (1851); *Ueber die Mikropyle* *und den feineren Bau der Schleimhaut bei den Insecteneiern* (1855); *Die Blasenbandwürmer* (1856); *Untersuchungen über Trichina Spiralis* (1860); *Die Parasiten des Menschen, etc.* (1863-76); *Zoologische Wandtafeln* (1877-98); *Ueber die Entwickelung der Sphaerularia Bombi* (1885). Leuckart's fame as a zoölogist and teacher was very great.

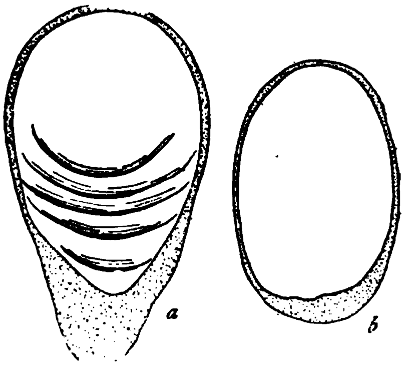
LEU'COCYTE (from Gk. λευκός, *leukos*, white + κύτος, *kytos*, cell). A lymphoid or amœboid cell. The name is generally applied to lymph-cells outside the blood-vessels, and to the white corpuscles of the blood (q.v.). The source of the white cells of the blood is undoubtedly the lymphatic glands as well as the bone-marrow, the spleen, and the gastro-intestinal lymph-follicles.

LEU'COCYTHÆ'MIA (Neo-Lat., from Gk. λευκός, *leukos*, white + κύτος, *kytos*, cell + αἷμα, *haima*, blood). A disease characterized by an increase in the number of white corpuscles in the blood, together with changes in the bone-marrow, spleen, and lymphatic glands. The disease was first noted by Bennett of Edinburgh, who considered the affection due to the presence of pus in the blood, and gave it its name. In the same year Virchow of Würzburg published his observations upon the disease and was the first accurately to recognize and describe it. He gave it the name 'leukæmia.' Virchow's theory of the pathogenesis has been adopted, viz., that it is primarily a disease of the blood-making organs, and that the conditions of the blood are secondary. The disease is common among the working classes, and the majority of the cases occur between the twentieth and fiftieth years. It is twice as common among men as among women. Malaria, syphilis, and traumatism are supposed to have influence as predisposing causes; but there is great reason to believe that the disease is essentially infectious in its nature. The symptoms of the disease are pallor, or an ashen color; palpitation of the heart; dyspnœa upon exertion; enlargement of the lymphatic glands, in bunches, most frequently in the neck; great enlargement of the spleen, with tenderness in the splenic region; enlargement of the liver; diarrhœa; nervous disturbances, including headache, languor, depression, delirium, or even mania; a tendency to hæmorrhage; deafness, and vertigo. An examination of the blood will readily determine the presence of the disease, and will decide whether the case in hand is of the myelogenous or the lymphatic variety of the disease. In the former, which is the more frequent form, there is an excess of the large mononuclear cells, especially of the myelocytes; and also large numbers of nucleated red corpuscles, notably of megaloblasts. In the lymphatic variety there is an unusual proportion of lymphocytes of the ordinary variety, or rather large, with paler nuclei and almost wholly without granules; while myelocytes and nucleated red corpuscles are present in very small numbers. Leucocythæmia is almost invariably fatal. The disease may run a course of from five to eight years, though the average duration is less than three years. Amelioration of the symptoms may be secured by treatment in some cases. Freedom from care, change of climate, a diet in which carbohydrates and fats are prominent, arsenic, quinine, bone-marrow, bitter tonics, and iron are all serviceable. Cold douches to the splenic region as well as faradization or galvanization of this region have relieved the pain or discomfort experienced there. Anorexia, indigestion, constipation, and diarrhœa demand special treatment. Consult Ehrlich, *Leukämie, Pseudoleukämie, Hämoglobinurie* (Vienna, 1901).

LEUCOLINE, lū'kō-lĭn. See QUINOLINE.

LEUCO'MA (Neo-Lat., from Gk. λεύκωμα, *leukōmu*, white spot in the eye, from λευκοῦν, *leukoun*, to whiten, from λευκός, *leukos*, white). The term applied to a white opacity of the cornea. It is also called albugo. It is the result of acute inflammation, giving rise to the deposition of coagulable lymph on the surface, or between the layers of the cornea. It is sometimes reabsorbed on the cessation of the inflammation, and the cornea recovers its transparency; but in many cases it is persistent and incurable. It may also be the result of previous ulceration or of injury to the cornea. The mildest degree of opacity is known as nebula, and a grade intermediate between this and leucoma as macula. When perforation of the cornea is followed by adhesion of the iris to the resultant scar, the condition is spoken of as adherent leucoma.

LEU'COPLASTS (from Gk. λευκός, *leukos*, white + πλαστός, *plastos*, formed, from πλάσσειν, *plassein*, to form). Minute colorless bodies (also called *Amyloplasts*), whose special function it is to accumulate starch and sometimes proteids into solid granular form. They are special organs of the protoplasm in active plant-cells. Similar to these are the plastids, including chromoplasts and chloroplasts (qq.v.). They may occur in any cell, but are mostly readily observed, because most abundant, in cells devoted to storage of reserve food. The starch-forming leucoplasts absorb the dissolved material (sugar?), convert it into starch, and begin to deposit this starch in their interior (see figure). The mature starch-grain is usually oval or roundish, rarely irregular. Structurally it is a sphere crystal, being composed of minute hair-like crystals (trichites), which radiate from a centre. Additions to the starch-grain, as it is growing, are made exclusively upon its surface. As the starch-grain increases in size in the interior of the leucoplast, the latter is stretched. If the grain originates in the centre of the leucoplast the stretching may be uniform, in which case nearly equal layers may be added to all sides. More often, however, it arises eccentrically, and



STARCH-GRAINS (WHITE) FORMING INSIDE LEUCOPLASTS.

a, An eccentric grain, with the bulk of the leucoplast on one end; *b*, a younger stage of the same.

then the main portion of the leucoplast lies at one side of the starch-grain, the smaller portion being stretched until it forms a very thin, almost invisible, membrane. In this case the additions to the starch-grain will be more rapid on the side where the larger mass of the leucoplast lies. If the leucoplast is ruptured, remaining in contact with only one side of the starch-grain, further additions will be confined to portions in contact with the leucoplast (see figure). If a starch-grain begins to develop at more than one point, two or more may arise within a single leucoplast, producing the so-called 'compound' starch-grains. The leucoplast is visible on the larger grains only after special treatment. In some cases leucoplasts accumulate in their interior masses of solid proteids which may or may not take the crystalline form. Such leucoplasts have recently been distinguished by the name proteinoplasts.

LEU'CORRHŒ'A (Neo-Lat., from Gk: *λευκός*, *leukos*, white + *ῥοια*, *rhoia*, a flow, from *ῥεῖν*, *rhein*, to flow), or 'THE WHITES.' A catarrhal discharge from the female generative organs, consisting of mucus or mucus and pus. Leucorrhœa is a symptom of disease of the mucous membrane lining the vagina, or the uterus, or possibly of the Fallopian tubes. Any pathological state which keeps the uterus in a condition of engorgement or of retarded circulation may result in leucorrhœa. It is a very common condition and may be of trivial character. It may be an indication of endometritis or salpingitis. Astringent or antiseptic douches are ordered by the physician if the trouble is simply vaginal. If it be uterine, intrauterine applications must be made by the physician. Constipation favors leucorrhœa.

LEUCOSTICTE, lū'kô-stĭk'tê (Neo-Lat., from Gk. *λευκός*, *leukos*, white + *στικτός*, *stiktos*, pricked, spotted, from *στίζειν*, *stizein*, to prick). The generic, and frequently the vernacular, name of a group of large fringilline birds, which inhabit the higher parts of the mountains of the Western United States and are often called 'rosy finches,' because of the red mixed with the brown of their plumage. They are active, beautiful birds, and have sweet songs. Consult: Coues, *Birds of the Northwest* (Washington, 1874); Keyser, *Birds of the Rockies* (Chicago, 1902).

LEUC'TRA (Lat., from Gk. *Λεῦκτρα*, *Leuktra*). A village of Bœotia, in Greece, famous for the great victory which the Thebans under Epaminondas (q.v.) won here over the Spartan King Cleombrotus (B.C. 371), in consequence of which the Spartan supremacy in Greece, which had existed since the close of the Peloponnesian War (B.C. 404), was broken forever. See THEBES; SPARTA.

LEUKERBAD, loi'kẽr-bät (Fr. *Loèche-les-Bains*). A watering-place in the Canton of Valais, Switzerland. It is situated on the right slope of the Rhone Valley at the entrance to the Gemmi Pass and at an elevation of 4500 feet above the sea. It has about twenty baths, impregnated with lime, and having a temperature varying from 88° to 124°F. Their use is recommended for rheumatism and skin diseases. Population, in 1900, 600.

LEURET, lẽ'rȧ', FRANÇOIS (1797-1851). A French physician, born in Nancy. He made a special study of the treatment of the insane and ultimately became director of the asylum at Bicêtre. His works include: *De la fréquence du pouls chez les aliénés* (1832), with Mitivié; *Fragments psychologiques sur la folie* (1834); *Anatomie comparée du système nerveux* (1839-58), completed by Gratiolet; and *Du traitement moral de la folie* (1840).

LEUTHEN, loi'ten. A village of Lower Silesia, Prussia, 9 miles west of Breslau, celebrated for the victory won there December 5, 1757, by Frederick the Great, with 34,000 men, over an Austrian army of about 90,000 under Prince Charles of Lorraine (Map: Germany, G 3). The loss of the Austrians was 10,000 in killed and wounded, 12,000 in prisoners, besides 116 pieces of artillery. The victorious army lost 6500 in killed and wounded. The result was the reconquest of the greater part of Silesia by the Prussians. Population, about 800.

LEUTHOLD, loit'hôlt, HEINRICH (1827-79). A German poet, born near Zurich and educated in that city and in Basel. His brief literary activity, mostly in Munich and Frankfort, was brought to an end by insanity, and he died in an asylum near Zurich. He was one of the most gifted members of the Munich group of poets. In collaboration with Geibel, Leuthold translated selected French lyrics (1862). He showed great beauty of form and much depth of thought in his lyrics and the (practically lyric) epic *Penthesilea*, posthumously published (1879).

LEUTZE, loit'se, EMANUEL (1816-68). A German-American historical painter of the Düsseldorf school. He was born in Gemünd, Württemberg, May 24, 1816. His parents came to the United States, settling first in Philadelphia, then at Fredericksburg, Va. He received his first instruction in art from J. A. Smith, a portrait painter, in Philadelphia. In 1840 one of his pictures attracted attention and procured him several orders, which enabled him to go to Düsseldorf, where he studied with Lessing. In 1842 he went to Munich, studying the works of Cornelius and Kaulbach, and the following year he visited Venice and Rome. In 1845 he returned to Düsseldorf and was married, making his home there for fourteen years. He devoted himself to American, Spanish, and English historical subjects, especially to the famous series of pictures of the Revolution, of which "Washington Crossing the Delaware" is the finest. In 1859 he returned to the United States; in 1860 he received the commission for the fresco on the staircase of the Capitol at Washington, entitled "Westward the Star of Empire Takes Its Way." In 1860 he was elected a member of the National Academy. He died in Washington, D. C., July 18, 1868, leaving several large cartoons for the decoration of the Senate Chamber.

Leutze is more famous for the subjects than for the technical qualities of his paintings. His color is often crude and his drawing academic, yet his composition is good and his figures show a high power of individualization. The most important works are: "Columbus Before the Council of Salamanca" (1841), purchased by the Düsseldorf Art Union; "Columbus in Chains" (1842); "Columbus Before the Queen;" "Landing of the Norsemen in America," Pennsylvania Academy, Philadelphia; "Cromwell and His Daughter;" "The Court of Queen Elizabeth;" "Henry VIII. and Anne Boleyn" (1858); "The Iconoclast;" "Washington at Monmouth;"

"Washington at the Battle of Monongahela;" "News from Lexington;" "Washington at Princeton;" "Lafayette in Prison at Olmütz visited by his Relatives" (1861); "Westward Ho;" portraits of Washington, Lincoln, Grant, and General Burnside; "Washington Crossing the Delaware" (1851-52), Metropolitan Museum, New York, and Kunsthalle, Bremen.

LEVAILLANT, le-vī'yäɴ', **François** (1753-1824). A French ornithologist and traveler, born at Paramaribo, Dutch Guiana. From 1781 to 1785 he traveled in South Africa, studying the natives and making collections of the birds and large mammals. His works include: *Voyage dans l'intérieur de l'Afrique* (1790); *Second voyage* (1796); and *Histoire naturelle des oiseaux d'Afrique* (1796-1812).

LEVANT' (OF., Fr. *levant*, ML. *levans*, Orient, sunrise, from Lat. *levare*, to raise, from *levis*, light), **The.** A name employed throughout the whole of Europe to designate the eastern parts of the Mediterranean Sea and adjacent countries. In a wider sense, it is applied vaguely to the regions eastward from Italy, as far as the Euphrates and the Nile; but more generally is used in a more restricted sense, as including only the coasts of Asia Minor, Syria, and Egypt.

LEVA'RI FA'CIAS (Lat., do thou cause to be levied), **Writ of.** In English law, an ancient writ of execution issued upon a judgment, by which the judgment creditor takes the real and personal estate, such as lands, houses, and furniture of his debtor to satisfy his debt. The mode by which this was done was by the sheriff drawing the rents and paying the creditor. The writ is now practically superseded by the writ of *elegit* (q.v.) as regards real estate, and *fieri facias* (q.v.) as regards personal estate.

LEVASSEUR, le-vȧ'sẽr', **Emile** (1828—). A French political economist and statistician, born December 8, 1828, in Paris. After studying at the Collège Bourbon he became a professor in the Lyceum at Alençon. He held this position for two years, and then went to Besançon. In 1856 he received an appointment at the Saint Louis Lyceum in Paris, and in 1872 became a professor in the Collège de France. He had previously (1868) been elected a member of the Academy. He was active in promoting the international congresses for the discussion of statistical and geographical topics, and was one of the founders of the French Society of Commercial Geography. His works include: *Investigation sur le système de Law* (1854); *La question d'or* (1858); *L'histoire des classes ouvrières en France* (1859); *Précis d'économie politique, La population française* (1889-91); *La France et ses colonies* (1893); *L'enseignement primaire dans les pays colonisés* (1897). He was a visitor to the United States on the occasion of the Columbian Exposition, and spent several months in the study of economic conditions in the United States. The fruits of his researches are embodied in his works *L'agriculture aux Etats-Unis* (1895) and *L'ouvrier américain* (1898).

LEVEE (Fr. *levée*, a raising, embankment, from *lever*, to raise, from Lat. *levare*, to raise). The name applied to an embankment constructed along the margin of a river to restrain its waters within the natural channel during floods, and particularly the name given to the flood embankments of the Mississippi River. The so-called dikes of Holland and of various European rivers and the flood embankments of the rivers Danube, Vistula, and Po are examples of levees according to the American usage of that term. The levees of the Mississippi River aggregate over 1200 miles in length, and are strung along a stretch of about 1000 miles of river from Cairo to the Mexican Gulf. The construction and maintenance of these levees are in charge of commissions maintained by the various States bordering on the river, and of a similar organization maintained by the United States Government and known as the Mississippi River Commission. The Mississippi River Commission did its first work of levee building in 1882, but the various State commissions had begun construction long before that time. The Government levees are built to standard forms and dimensions varying with the height of the embankment required; roughly described they are embankments of earth having a broad bottom and narrower top and sloping sides. They are constructed by depositing earth in two-foot layers on a foundation cleared of all roots and stumps, and thoroughly plowed, and then sodding the top and sides with Bermuda grass at two-foot intervals. For a recent description of the Mississippi River levees, consult: Starling, "The Levees of the Mississippi River," *Engineering News*, vol. xxv.; and Copee, "Standard Levee Sections," *Transactions of the American Society of Civil Engineers*, vol. xxxix. (See Drainage; Embankment.) The article Mississippi River contains a full account of the history and construction of the various improvements on that river, including the system of levees.

LEVEE. The state ceremonial of any sovereign receiving visits from those subjects whose position entitles them to that honor. By the usage of the Court of Great Britain, a levee differs from a drawing-room in this respect, that gentlemen only are present (excepting the chief ladies of the Court), while at a drawing-room both ladies and gentlemen appear. The name arises from the ceremonial attending the rising of the King of France under Louis XIV. and his successors. The *grand lever* was the more public, after the King had been shaved and invested with his wig; the *petit lever*, more intimate, was held immediately after he had been awakened and had said his prayers. Even to this a large number of privileged people were admitted, successively in five classes, comprising not only the royal family, but all kinds of officials, domestic, civil, and military. Under Louis XVI., whose tastes were simple and who rose at seven or eight o'clock, the ceremonial *lever* was usually postponed until half-past eleven, thus approximating more nearly to the modern levee. The term has also been applied to any gathering of a number of persons at various hours, and in the United States is frequently used to designate the public receptions of the President.

LEVEL (OF. *livel, liveau, liveal, nivel, niveau*, Fr. *niveau*, Sp. *nivel, nivello*, Port. *livel, nivel*, It. *livello*, from Lat. *libella*, level, balance, diminutive of *libra*, balance, pound). A name especially used in ore-mining and referring to the horizontal excavations made at regular intervals from a shaft (q.v.). They are commonly 50 or 100 feet apart vertically, and in veins usually run parallel with the strike. In some regions, such as the anthracite region of Pennsylvania, the term gangway is used instead of level, and the main gangway is called the entry. Chambers and drifts are usually run off from the levels.

LEVELERS. An ultra-reform party which arose in the army of the Long Parliament, when the army overawed that body, and sent Charles I. to Hampton Court in 1647. They determined to level all ranks and establish an equality of titles and estates throughout the Kingdom. Several of the officers belonging to this party were cashiered in 1649; and on the departure of Cromwell for Ireland, at the close of that year, they raised mutinies in various quarters, which were suppressed by Fairfax with bloodshed. One of their works, *The Leveler, or the Principles and Maxims Concerning Government and Religion of Those Commonly Called Levelers*, shows that in politics their fundamental principles included: (1) The impartial authority of the law; (2) the legislative power of Parliament; (3) absolute equality before the law; (4) the arming of the people for securing the enforcement of the laws, and the protection of their liberties. In religion they claimed: (1) Absolute liberty of conscience; (2) freedom for every one to act according to his knowledge, even if this knowledge should be false; (3) religion to be considered in two aspects—one as the correct understanding of revelation, which is a private affair, the other as its effects manifested in actions, which are subject to the authorities; (4) they condemned all strife on matters of faith and forms of worship. This sect disappeared at the time of the Restoration.

LEVELING. In surveying, the operation of ascertaining the different elevations of objects on the surface of the earth. Leveling is employed to find the relative elevation of points a considerable distance apart, to obtain the profile of a line, or to establish a grade. These objects may be more or less intermingled in any piece of work. For convenience of discussion, leveling operations may be broadly classed into common spirit-leveling, trigonometrical leveling, and precise spirit-leveling. The difference between the first and the third classes lies chiefly in the degree of accuracy with which the work is performed. Spirit-leveling operations are essentially the same whatever their object may be. For example, suppose it is required to determine the difference in elevation between two distant points. The instruments are the level and the level-rod, forms of which are illustrated on the Plate of Engineering Instruments. The rod is set up on the starting-point and the level is set up a convenient distance away in the direction of the other point, and where a plain view is had of the level-rod. When the level is adjusted, the levelman takes a reading on the graduated level-rod and records it in his note-book. The rodman then moves his rod to a point ahead of the level, and the levelman takes another reading, which he likewise records. This reading is called a foresight, in contradistinction to the first reading, which is called a backsight. The levelman then removes his level to a point ahead of the second position of the rod, sets it up, adjusts it, and takes a backsight reading on the rod. This being recorded, the rodman moves to a new position ahead of the level, where he sets up the rod on which the levelman takes a foresight reading, and then moves again to a new position ahead of the rodman. By means of sufficient repetitions of these operations the distance between the two points whose differences in elevation are to be determined is traversed, the last reading being taken with the rod set up on the finishing-point.

When the final reading has been taken a simple calculation in addition and subtraction performed on the recorded readings gives the levelman the result he desires, which is the difference in elevation between the starting and the finishing points. In conducting such a series of readings as has been described, the attempt is always made to make the lengths of the backsight and foresight for each setting of the level as nearly equal as possible, and also to make them as long as possible consistent with clearness of sight.

It is in this way that the profile of the route of a railway line or highway is determined. Having obtained the natural profile, the engineer in railway or road building has to cut down the irregularities by means of one or more uniform gradients. These he determines first on paper, figuring out the rate of ascent or descent. Supposing that he has determined a grade of one foot in a hundred feet, then each succeeding intervening point is one foot higher or lower, according to direction, than the preceding point. The levelman then re-runs his line of levels according to this adopted gradient, and marks on the stake at each intervening point the elevation at which its top is above or below the adopted grade-line.

Precise spirit-leveling is performed in exactly the same way, except that larger and more perfect instruments are employed and more care is taken in making the readings and performing other necessary operations.

In trigonometric leveling the difference of elevation between two different points is determined by measuring the vertical angle, the horizontal distance between the two points having been previously measured by triangulation. (See Surveying.) This distance and the vertical angle give the necessary data for the calculation of the difference in elevation by the familiar rules of trigonometry. This method of leveling is liable to error from refraction, and is far less precise than spirit-leveling when the latter method is practicable. Elevations of different points, as the tops of mountains, are often measured by barometer or by noting the temperature at which water boils. These are not exact methods, and are used only in exploration work. See Hypsometry.

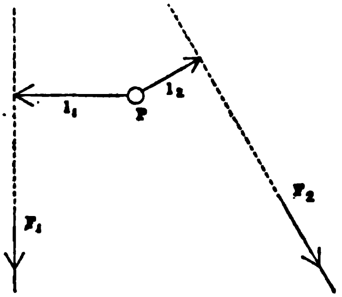
LEVEN, lĕ'v'n, Loch. A picturesque lake in the east of Kinross-shire, Scotland (Map: Scotland, E 3). It is oval in shape, about four miles long and two wide. It is celebrated for its trout. Loch Leven Castle, in which, in 1567, Queen Mary was imprisoned and forced formally to abdicate the throne, and whence she escaped in 1568, is one of the islets in the lake.

LEVENSHULME, lĕ'v'nz-hŭlm. A manufacturing town in Lancashire, England, three and one-half miles southeast of Manchester (Map: England, D 3). Population, in 1891, 5500; in 1901, 11.500.

LÉVÊQUE, lâ'vâk', Jean Charles (1818-1900). A French philosopher, born at Bordeaux. He was a pupil of the Normal School, taught at Besançon, and studied in Athens (1847-48).

After his return to France he taught at Toulouse, Besançon, and Nancy. He was appointed to the chair of Latin and Greek philosophy at the College of France in 1856, and became a member of the Institute in 1865, and vice-president of the Académie des Sciences Morales et Politiques in 1873. In philosophy he was a pupil of Cousin. His works include: *La physique d'Aristote et la science contemporaine* (1860); *La science du beau, ses principes, ses applications, son histoire* (1872); *Etudes de philosophie grecque et latine* (1864); *Le spiritualisme dans l'art* (1864); *La science de l'invisible* (1865); and *Les harmonies providentielles* (1872; 4th ed. 1885).

LEVER (OF. *leveor, leveur*, Fr. *leveur*, lever, from Lat. *levator*, lifter, from *levare*, to raise). A form of machine much used in simple physical instruments. It consists essentially of a rigid body pivoted at one point. If the body is acted on by two forces (F_1 and F_2) in different directions, which hold it in equilibrium, the formula for the mechanical advantage can be deduced at once; the general principle being that since there is equilibrium the moment of one force around the pivot at P, i. e. F_1l_1, must equal the moment of the second force around the same axis, i.e. F_2l_2. The fixed point is called the 'fulcrum,' and l_1 and l_2 the 'lever-arms.' Thus to balance a force F_1 a force F_2 is necessary, where $F_1l_1=F_2l_2$. The 'mechanical advantage' is therefore, l_1/l_2.



LEVER.

Another mode of deducing the same formula is to consider the system displaced slightly when in equilibrium under the forces F_1 and F_2. The point of application of F_1 will move a distance x_1; that of F_2, a distance x_2. By the principle of energy $F_1x_1=F_2x_2$; but by geometry, if the displacement is small, $\frac{x_1}{l_1}=\frac{x_2}{l_2}$, and hence $F_1l_1=F_2l_2$, as before.

In some levers the fulcrum lies between the two balancing forces, e.g. pump-handle, crowbar, scissors. In other cases it lies beyond the forces, e.g. sugar-tongs, nut-cracker, claw-hammer, a wheelbarrow. See MECHANICS.

LEV'ER, CHARLES JAMES (1806-72). An Irish novelist, born in Dublin, August 31, 1806. He graduated B. A. from Trinity College, Dublin, in 1827, and then studied medicine at Göttingen, Germany. A visit to Canada in 1829 he subsequently turned to good use in *Arthur O'Leary* (1844) and *Con Cregan* (1849). Returning to Dublin, he took his medical degree at Trinity (1831), and received several appointments from the Board of Health. In the *Dublin University Magazine* for February, 1837, appeared the first installment of *Harry Lorrequer*. This was followed by *Charles O'Malley, Jack Hinton, the Guardsman, Tom Burke of Ours, The Martins of Cro' Martin*, and *Roland Cashel*. These novels, pervaded with a spirit of farcical humor, were immensely popular. By 1850 the vein had, however, been a little too well worked. Lever displayed a quieter humor in *The Dodd Family Abroad* (1853-54), depicting English life on the Continent. His later work is less interesting. Lever lived much on the Continent and there gathered material for his novels. In 1840 he was physician to the British Legation at Brussels. In 1857 he was appointed Consul at Spezia and ten years later at Trieste, where he died June 1, 1872. His *Works* were published by Routledge (33 vols., London, 1876-78; since reprinted), and in the Barrington Edition (32 vols., Boston, 1902). Consult his *Life*, by Fitzpatrick (London, 1879).

LEVERET (OF. *levret*, diminutive of *levre*, Fr. *lièvre*, It. *lepre*, hare, from Lat. *lepus*, hare). The young of the hare during the first year of its age. See HARE.

LEV'ERETT, JOHN (1616-79). An American colonial official. He came to Boston with his father in 1633 from Boston Parish, England, but went back to serve in the Parliamentary Army in 1644. He was a captain under Cromwell, who became his friend. On his return to Boston he was a member of the General Court (1651-52), and was sent to bring Maine under the jurisdiction of Massachusetts. He also took part in the capture of settlements along the Saint Lawrence. In 1666 he went to England to represent the Colony, and remained six years. On his return he was made Speaker of the General Court and major-general of the militia. For six years he was in the Governor's Council, and was then made Deputy Governor. When Bellingham died in 1672 he filled out his term. He was regularly elected Governor in 1673, and died in office. Consult the *Report of the New England Genealogical Society* for 1881.

LEVERRIER, le-vâr'yâ', URBAIN JEAN JOSEPH (1811-77). A French astronomer, born at Saint-Lô. He was admitted to the Ecole Polytechnique in 1831, and was subsequently employed for some time as an engineer in connection with the Government tobacco monopoly. His *Tables de Mercure* and several memoirs on 'the secular inequalities' opened to him the door of the Academy in 1846. At the instance of Arago he applied himself to the examination of the disturbances in the motions of the planets, from which the existence of an undiscovered planet could be inferred; and, as the result of his laborious calculations, directed the attention of astronomers to the point in the heavens where, a few days afterwards, the planet Neptune was actually discovered. The elements of the orbit of the planet had also been calculated by the English astronomer Adams in 1845, but no search was made for the planet. For this Leverrier was rewarded with the grand cross of the Legion of Honor, a professorship of astronomy in the Faculty of Sciences at Paris, and various minor honors. In 1854 Leverrier was appointed to the directorship of the Observatory of Paris, an office which, save during an interval of three years (1870-73), he held till his death. See ADAMS, JOHN COUCH; NEPTUNE.

LEVERWOOD. A synonym for ironwood. See HORNBEAM.

LEVESON-GOWER, lōō'son-gōr', GRANVILLE GEORGE. See GRANVILLE, SECOND EARL.

LEVETZOW, lĕv'ĕt-sō, ULRIKE, Baroness von (1804-99). A friend of Goethe. She met him at Marienbad and Karlsbad in 1822 and 1823, when she was eighteen and he was seventy-three. The poet was much struck with her wit and beauty and addressed to her a *Trilogie der Leidenschaft*.

LE'VI (Heb. *Lēwi*, probably a Gentilic form for Leah; possibly connected with *lāwah*, to join). According to the Book of Genesis, the third son of Jacob and Leah (Gen. xxix. 34), eponymous ancestor of the Levites (q.v.). With his brother Simeon he is reported to have treacherously slaughtered the Shechemites for their outrage on his sister Dinah, an act for which Jacob administered a reproof (Gen. xxxiv.), and even on his death-bed cursed Simeon and Levi, saying they should be scattered in Israel (Gen. xlix, 5-7). This curse is probably a reminiscence of tribal quarrels and refers to events which occurred after the entry of the Hebrews into Canaan. That both these tribes were practically wiped out appears to follow from the circumstance that Simeon occupies territory in Judah (Joshua xix. 1-9), while Levi has no territory at all. Neither of these tribes plays any part in the political history of the northern or southern kingdom. In view of the fact that Levites became guardians of sanctuaries (cf. Judges xvii.), the term Levite acquired the sense of a priest—a development assisted by the popular etymology of Levi (cf. xxix. 34), which implied that a Levite was one who was 'attached' (i.e. to a sanctuary).

LEVI, LEONE (1821-88). An English economist, born in Ancona, Italy, of Jewish parentage. In 1844 he removed to Liverpool, where he was naturalized as a British citizen. A few notes to one of the Liverpool papers upon chambers of commerce and commercial tribunals led to the founding of such organizations in several of the leading cities. Levi became honorary secretary of the Liverpool Chamber of Commerce and was active in efforts for the improvement of the commercial law. His work on Commercial Law (1850-52) led to the creation of a royal commission and many important amendments. In 1852 Levi was appointed professor of commerce at King's College, London. He was an active participant in the work of the Statistical Society, the Law Amendment Society, and kindred organizations. His principal work was his *History of British Commerce and of the Economic Progress of the British Nation 1763-1870* (London, 1872). He died May 7, 1888.

LÉVI, lā'vē', SYLVAIN (1863—). A distinguished French Orientalist of Jewish descent. His interest in India was developed at an early age, and in 1886 he was appointed instructor in Sanskrit at the Ecole des Hautes Etudes. In 1890 Lévi received the degree of docteur ès lettres, for which he presented his thesis *Quid de Græcis Veterum Indorum Monumenta Tradiderint*. The same year saw the publication of his study on the Sanskrit drama (*Le théâtre indien*), which still remains the standard work on this subject. In 1894 he was appointed full professor in Sanskrit at the Collège de France. In 1898 the second important work of Lévi appeared, entitled *La doctrine du sacrifice dans les Brâhmaṇas*.

LE'VI, SON OF ALPHÆUS. See MATTHEW.

LEVI'ATHAN (Heb. *liwyāthān*). A monster mentioned several times in the Old Testament. The word is used both in a specific and a general sense. As a specific term (Ps. lxxiv. 14; Job xli. 1) it signifies the crocodile; but it is also used in a wider sense, as a kind of cloud-snake which darkens the heavens (Is. xxvii. 1), a large sea-monster of uncertain kind (Ps. civ. 26), and as 'monster,' or dragon, in an entirely general sense (Job iii. 8, Hebrew text; cf. Revised Version and Authorized Version, marginal reading). As a mythical monster, the leviathan appears also under various names such as *Rahab* and *Behemoth*, and it has been plausibly demonstrated by Gunkel (*Schöpfung und Chaos*, Göttingen, 1895) that the conception is allied to that of Tiamat, the dragon who in the Babylonian creation story is overcome by the god Marduk. Gunkel has proposed the theory that the leviathan represented originally a mythological monster, fought with and overcome by Yahweh. The dragon which plays so prominent a part in the Apocalyptic literature of the New Testament and also appears in the Old Testament Apocrypha (e.g. Bel and the Dragon) reverts to the conceptions connected with Leviathan and Tiamat.

LEVIATHAN, THE, or THE MATTER, FORM, AND POWER OF A COMMONWEALTH, ECCLESIASTICAL AND CIVIL. A philosophical treatise by Thomas Hobbes (1651). It embodies Hobbes's views of politics, which he claimed emerged from primitive anarchy to their complete form in monarchy. The idea of absolutism here advocated is Hobbes's most celebrated speculation.

LEVIATHAN OF LITERATURE, THE. A title given to Dr. Samuel Johnson.

LEVIEN, lā'vĕn', ILSE (1852—). A German novelist and lyric poet, whose pseudonym is Ilse Frapan. She was born at Hamburg, and was for many years a teacher. In 1884 she went to Stuttgart to study æsthetics, and was an intimate friend of Vischer for the last four years of his life. She wrote *Vischer-Erinnerungen* in 1889. Then she spent two years (1889-90) at Munich and was a member of Paul Heyse's literary circle. Her other publications include: *Hamburger Novellen* (1886); *Zwischen Elbe und Alster* (1890); *Bittersüss* (1891); *Querköpfe* (1895); *Vom ewig Neuen* (1896); *In der Stille* (1897); and the volume of poems, *Gedichte* (1891).

LEVIN, lā-vēn', RAHEL. See VARNHAGEN VON ENSE.

LEV'IRATE MARRIAGE (from Lat. *levir*, Gk. *δαήρ*, *daēr*, Skt. *dēvara*, AS. *tācor*, OHG. *zeihhur*, husband's brother). The marriage of a man to the widow of his deceased brother. This was an ancient usage widely prevalent at certain stages of civilization, and rests ultimately upon the circumstance that the wife as the property of a man passed at his death with his estate to his heir, upon whom the obligation rested to provide for the widow and her children, or if there were no children, to secure issue. Gen. xxxviii. is an example of this usage. The ancient custom is carried over into the Deuteronomic Code (Deut. xxv. 5-10), where provision is made that a man must marry his deceased brother's widow in case no son is born of the first marriage. However, certain modifications are introduced which indicate a departure from the earlier custom. The obligation rested on a surviving brother only in case he 'dwelled together' (i. e. on the family estate) with the deceased; and while formerly all the male offspring of the second marriage were regarded as the issue of the deceased, according to Deuteronomy only the eldest son of the new marriage was to be so considered. It appears also that even with these modifications, the custom was falling into disuse, for the Deuteronomic Code provides a ceremony whereby a surviving brother can evade the obligation, though in doing so he is subjected to an insult by the widow, who draws off her brother-in-law's sandal and spits in his face. The situation in the post-exilic Book of Ruth implies this custom, though still further modified. The brother of Elimelech upon whom rested the obligation to marry Naomi forfeits the privilege and also the duty to redeem the field which Naomi was forced to sell, but there is no longer connected with the formal repudiation any such ceremony of public obloquy as is prescribed in Deuteronomy. The Priestly Code (Lev. xviii. 16; xx. 21) represents the final stage in the decay of this custom—its abrogation. Marriage with a deceased brother's wife is forbidden without qualification, and evidently because of economic abuses to which the ancient custom led with advancing social culture. The contradiction between Deuteronomy and Leviticus was embarrassing to the Jewish Rabbis. In the days of Jesus the levirate law was still observed in certain circles, but the Talmud effects a compromise by recognizing the validity of the Priestly Code, but combining its execution with the performance of the ceremony prescribed in Deuteronomy, which is still observed among orthodox Jews. Consult the Hebrew archæologies of Norwack and Benzinger.

LEVIS, le-vē′ *or* lĕv′ĭs, or POINT LEVI. The capital of Levis County, Quebec, Canada, on the south bank of the Saint Lawrence, opposite the city of Quebec (Map: Quebec, E 4). It has the Lorne graving dock, 500 feet long, which admits vessels drawing 25 to 26 feet of water, and the wharves where passengers from the ocean steamships are landed, and is protected by substantial fortifications crowning the heights from which General Monckton bombarded Quebec in 1759. It is connected by ferries with Quebec; is on the Intercolonial Railway, and is the terminus of branches of the Grand Trunk Railway and the Quebec Central Railway. Population, in 1891, 7301; in 1901, 7783.

LÉVIS, lā′vē′, FRANÇOIS GASTON, Duke of (1720-87). A French soldier, born at Château d'Ajac, Languedoc. After serving in the army in Bohemia, Germany, and Italy during the War of the Austrian Succession, he was sent to Canada (1756), where he was second to Montcalm in the campaigns against the British. He was promoted major-general for his leading share in the successful defense of Carillon (1758) against a far superior force of English. He repulsed General Wolfe at Montmorenci (1759), and after the death of Montcalm took command of the remnants of the French army. He kept up a hopeless but gallant fight against the conquering British throughout the succeeding winter. In the battle of Sainte Foye (1760) he won a victory over them that would have resulted in Quebec changing hands once more had the French instead of the English ships arrived with the opening of navigation. After his return to France Lévis was made lieutenant-general in 1761, served in the Rhine campaigns, was with Condé at the victory of Johannisburg, and became Governor of Artois in 1765, a marshal of France in 1783, and a duke and peer of the realm in 1784.

LEVI′TA, ELIAS, or ELIA LEVI BEN ASHER, surnamed Ashkenasi, the German; Habbachur, the Master; and Hammedakdek, the Grammarian (c.1468-1549). A Jewish grammarian and exegete. He was born at Neustadt on the Aisch, near Nuremberg, about 1468. In 1496 he went to Italy, where he taught Hebrew mainly, if not solely, to Christians. He first taught in Venice, then in Padua, and next in Rome, where he had Cardinal Egidio as a pupil. From Rome he returned to Venice, and here he gave lessons to the French Ambassador, George de Silve; then he went to Isny, in Swabia, and finally returned to Venice. No Jews were allowed to live in France at this time, but Elias Levita received the unique honor of an invitation—which he declined—from King Francis I. to come to France and teach the Hebrew language. He died in Venice in 1549. His principal works are: a Hebrew grammar, entitled *Bahur* (1518); a treatise on the Masora, *Masoreth ha-Masoreth* (1538), important for the study of the Hebrew text of the Old Testament; and a dictionary of the Targum, *Meturgeman* (1541). His book, *Tishbi* (1541), a compilation of 712 articles treating chiefly of Rabbinic Hebrew, and his *Tub Taam*, a treatise on accents in Biblical Hebrew, also deserve mention. Elias Levita's Hebrew knowledge was derived mainly from the works of the *Kimchis* (q.v.).

LE′VITE (Lat. *Levites*, Gk. *Λευίτης*, *Levitēs*, from Heb. *Lēwī*). The designation in the Pentateuch for servitors attached to the sanctuary of Yahweh. The usage of Levite in the various codes supposed to be found in the Pentateuch differs in an important particular. In the Deuteronomic Code the priests are referred to as 'the Levite priests,' a distinction between priest and Levite being unknown at the time of the compilation of this code (c.623 B.C.). Ezekiel, however, introduces a distinction between priests of the family of Zadok, who presided over the temple from the days of Solomon, and Levites (chs. xliii.-xliv.). By Levites are meant the former priests of the sanctuaries (or high places) in Israel and Judah, which by the Deuteronomic Code had been abrogated in favor of the centralization of the cult in the Jerusalem temple. These Levites, as a punishment for maintaining a cult that to the exilic writers appeared idolatrous, were to be degraded to the position of the temple servants, subordinate to the Zadokites. This distinction is fully carried out in the 'Priestly Code' (Leviticus and Numbers). A compromise is effected between the priests of Jerusalem and those who served in the other sanctuaries by recognizing the descent of all from an eponymous ancestor, Levi; but, on the other hand, within this tribe, special prerogatives are accorded to a particular family—that of Aaron, to whose hands the priesthood proper is intrusted. This did not involve the setting aside of the privileges of the Zadokites, whose descent was reckoned from Aaron through the latter's son Eleazar (I. Chron. xxiv. 3), while removing any opprobrium attached to the Levites by giving them a common origin with the priests. It is evident from a consideration of this development in the use of the term Levite that it originally designated a 'priest' (see Levi). The connection of Levite as priest with the supposed tribe of Levi is remote and to a large extent artificial. The ancient tribe of Levi (as we see from Gen. xlix. 5) was warlike, and the story of the treacherous attack of Simeon and Levi upon Shechem (Gen. xxxiv.) is not merely an illustration of this character of the tribe, but also points to its practical annihilation. In the distribution of Canaan among the tribes, Simeon is settled in the territory of Judah, while Levi receives no territory, because the tribe was dispersed—practically wiped out. Some remnants became attached to sanctuaries as guardians (cf. Judges xvii.), and from this fact the term Levite acquired the sense of one doing service at a sanctuary. This usage was taken up by the writers who reconstructed Hebrew history on the theory which traced the religious organization back to Moses (see Hexateuch), and carried out in the manner above indicated. All priests being thus traced back to Levi, the tribe as a whole is regarded as consecrated to the service of Yahweh by way of a substitute for the offering of the first-born in each family of Israel, who rightfully belonged to the deity (cf. e.g. Num. iii. 12). As servants of the sanctuary, supported by the temple income, the Levites were not obliged to cultivate the land, and hence owned no territory. In this way the theory fitted in well with the pre-exilic conditions, in which period the Levites as a tribe play a part in the political history and possess no territory. An exception is made in respect to the cities of refuge which are assigned to the priests, but which are merely old sanctuaries recognized as sacred asylums to which murderers flee from the avenger of blood (q.v.).

The duties of the Levites are specified in the Priestly Code and elaborated in the Book of Chronicles. They were not properly servants of Yahweh, but servants to the Aaronite priests to whom they were 'given.' They were not permitted to approach the inner sanctuary. They had charge of the sacred vessels and prepared the animals for the sacrifice. Menial duties, such as the cleaning of the vessels and of the temple halls, were also imposed on them, as well as 'watch' duties. According to the Priestly Code, one-tenth of the tithes only belonged to the Levites; but it would appear from the Book of Nehemiah that their income in fact was larger. Not all of the provisions, it must be borne in mind, were carried out; and on the whole the position of the Levites, who so far outnumbered the priests proper, was better than the Priestly Code would lead us to suppose. Consult: Graf, "Zur Geschichte des Stammes Levi," in *Merx's Archiv.*, vol. i. (Halle, 1869); Wellhausen, *Prolegomena zur Geschichte Israels* (5th ed., Berlin, 1899); Maybaum, *Entwickelung des altisraelitischen Priestertums* (Breslau, 1880); Baudissin, *Geschichte des alttestamentlichen Priestertums* (Leipzig, 1889); Curtiss, *The Levitical Priests* (London, 1877); Vogelstein, *Der Kampf zwischen Priestern und Leviten seit den Tagen Ezechiels* (Stettin, 1889); and the Hebrew archæologies of Nowack and Benzinger. See Priests.

LEVIT′ICUS (Lat. *Leviticus*, Gk. Λευιτικόν, ***Levitikon***, pertaining to the Levites, from Λευίτης, *Levitēs*, Levite), Book of. The name of the third book of the Pentateuch, derived from the title given to it in the Greek translation, 'the Levitical book,' as treating chiefly of the functions of the Levites, the term Levitical being used as synonymous with sacerdotal. Like Exodus and Numbers, however, it contains also historical material and is viewed by critics as part of a great historical compilation in whch the legal codes have been inserted at the point at which, according to the historical theory underlying the Pentateuch (q.v.), they were promulgated. The historical sources in Leviticus are considered the same as are found in the other books of the Pentateuch and in Joshua—namely, the compilation known as JE (see Elohist and Yahwist; Hexateuch), and the Priestly narrative, together with additions and interpolations by the group of editors who welded the narratives together with the Pentateuchal codes. In Leviticus itself two codes are embodied: the so-called 'Law of Holiness' (Lev. xvii-xxvi.) and the Priestly Code, which, besides embracing the rest of the book, extends through the Book of Numbers. Of these the former, compiled during the Exile, has been made to conform in the editing process to the Priestly Code, though not entirely so, while the latter is the law book that was presented to the Jewish community of Jerusalem through Ezra and Nehemiah (qq.v.) and finally adopted as a binding ordinance in B.C. 444. The 'Law of Holiness,' which is so called because of the prominence attached therein to the 'holy' character of the Hebrew nation, deals with the following topics: domestic animals, slaughtered for offerings to Yahweh, and prohibition against the eating of blood (ch. xvii.); laws against incest set forth in detail (xviii.); miscellaneous commandments of a moral and social character (xix.); prohibition of the Moloch cult and another law of incest (xx.); regulations for priests, restrictions in regard to mourning and marriage, priests to be without physical blemish, ordinances with regard to the eating of sacrificed animals, which must also be without blemish (xxi-xxii.); order and nature of festivals (xxiii.); ordinances regarding oil for lamps in the tabernacle, shewbread, blasphemy, manslaughter, and torts (xxiv.); Sabbatical year and Jubilee (xxv.); closing remarks of a hortatory character (xxvi.). Many of the ordinances in this code, particularly those in reference to the slaughter of animals, the lamps, and the shewbread, are based on older customs or decisions which have been elaborated and revised.

The Priestly Code in Leviticus may be subdivided into three sections as follows: (1) chapters i.-vii.; (2) chapters xi.-xv.; (3) chapter xvi. Of these the first section contains the sacrificial laws systematically arranged with reference to (a) burnt offerings, (b) meal offerings, (c) peace offerings, (d) sin offerings, (e) trespass offerings. To these are added a series of rules, chiefly for the guidance of the priests, and some further specifications with regard to the various kinds of offerings. The second section (xi.-xv.) deals with cleanness and uncleanness in general. The beginning is made with clean and unclean animals, which are enumerated in detail, with their distinguishing signs (ch. xi.), and the consequences of deflement by contact with unclean animals and the carcasses of clean animals. In chapter xii. uncleanness connected with child-birth and regulations for purification are given. Chapter xiii. treats of skin diseases as causes of uncleanness, examination of signs pointing to leprosy, and discrimination between innocent eruptions and genuinely 'unclean' symptoms. Chapter xiv. makes application of the method to stuffs, cloth, leather, to spots on the walls of houses, and methods of purification. Chapter xv. treats of uncleanness resulting from sexual secretions and discharges in men and women. Chapter xvi. contains the ritual for the Day of Atonement.

In placing the origin of the Priestly Code in the post-exilic period it must not be supposed that its ordinances represent innovations belonging to this late date. The aim of the compiler or compilers of the code in fact was to produce something which might so far as possible appear old. Hence not only regulations in former codes were taken up, but ancient customs and ritualistic decisions were retained if found consistent with the religious standpoint reached by the pious Yahwists of the Exile. In the Priestly Code accordingly we can pick out a large number of smaller ritualistic compendia embodying the practice of the Jerusalem priests before the Exile. So, e.g. within chapters i.-vii., we find (vi. 8-vii. 2) a group of instructions to priests which embody relatively ancient practices with additions. Chapters i.-vi. are supplements to the subject dealt with in this group of regulations. Again the regulations for 'taboos' of food, persons, and objects rest upon ancient customs which the Hebrews shared with surrounding nations, and even the formulation of the ordinances may be relatively old, though in their present form they betray evidence of having passed through several editing stages. Chapter xvi. furnishes a good illustration of the manner in which the old and the new have been combined in the Priestly Code. It is told in chapter x. how two priests, represented in tradition as sons of Aaron, incurred the wrath of the deity by a ceremonial error (carrying unhallowed fire in their censers). In connection with this story—for chapter xvi. is directly connected with chapter x.—the precautions are set forth which must be observed by the priests in order to avoid a similar misfortune. Incidental to these prescriptions, an old piacular ritual is introduced, involving the sending away of a scapegoat into the wilderness. This rite—a survival of demon-worship, and bearing on its face the mark of primitive conceptions of sin—is carried over into the solemn Atonement Day, of which no mention is made in the pre-exilic codes, and which is essentially a feature of post-exilic Judaism.

The manner in which the atonement rites are set forth incidental to an actual or supposed occurrence is also a characteristic feature of the literary method pursued in Leviticus, which regards the codes from the point of view of the historian. This point of view prompts the Priestly compiler to break off the Priestly Code at the end of chapter vii., and insert a narrative of the sacred institutions—a description of the consecration and installation rites for the priests at the time of the setting up of the tabernacle and the inaugural sacrifices on that occasion. Chapter viii. belongs therefore to Exodus, chapter xl., while chapter xxix. is directly connected with Exodus, chapters xxv.-xxix. Whatever the other motives of the rearrangement may have been, involving the tearing apart of component pieces, the desire to give an historical setting to the codes was certainly uppermost in the mind of the compiler of the Priestly narrative and of the subsequent school of editors. Into the priestly narrative were taken up JE and the Priestly Codes, while the Code of Holiness was added by later redactors, who also endeavored, though without complete success, to adjust the two codes to one another.

Bibliography. Consult: the commentaries of Baentsch, Svack, Keil, Kalish, and Dillmann (3d ed., by Ryssel); Driver and White, "Leviticus," in Haupt, *Sacred Books of the Old Testament* (Leipzig, 1894; in the new Eng. trans., New York, 1898); Addis, *Documents of the Hexateuch*, vol. ii. (London, 1898); Carpenter and Battersly, *The Hexateuch* (London, 1900); Baentsch, *Das Heiligkeitsgesetz, Lev. 17-26* (1893); and the introductions to the Old Testament of Driver, Kuenen, Cornill, König, and Holzinger.

LEVKOSIA, lĕf-kŏ'sē-ȧ. Another name for Nicosia (q.v.).

LEV'ULOSE. See Sugars.

LEVY. See Armies; Conscription; Recruitment.

LEVY (OF. *levee*, Fr. *levée*, a raising, embankment). In its legal sense, the seizure and taking possession of the property of a person, by a proper officer, under a writ or other process of law. It was formerly specifically used to designate the proceedings in connection with a fine (q.v.) of lands, but this has fallen into disuse. The most common employment of the term in the law is to describe the act of a sheriff, marshal, or other officer, whereby he seizes the property of a judgment debtor under an execution (q.v.), or *fieri facias* (q.v.), for the satisfaction of the judgment.

To constitute a valid levy the officer must take actual possession of the property. In case of personal property he should retain actual custody of it, either by locking it up or putting a deputy in charge of it; in case of real property he should enter and show by open and unequivocal acts that he has taken legal possession under his process, but in most States the judgment debtor is not ejected from the property, as his possession is subject to the levy and subsequent sale.

The term levy is also applied to the seizure of property under a writ of attachment. The rules as to taking possession of the property of the person named prevailing under this writ are similar to those under an execution against property. See Attachment; Execution; Sale; Sheriff; and consult the authorities there referred to.

LÉVY, lȧ'vē', Emile (1826-90). A French genre and portrait painter. He was born in Paris, August 29, 1826. He was a pupil of Abel de Pujol and Picot, and studied at the Ecole des Beaux-Arts. He won the Grand Prix de Rome in 1854. On his return from Italy he settled in Paris, and devoted himself to portrait painting. He exhibited in the Salon, receiving a first-class medal in 1878, and the Legion of Honor in 1867. Among the more important of his works are: "Noah Cursing Canaan" (1855); "Supper of the Martyrs" (1859); "Death of Orpheus" (1866), Luxembourg Museum; "Love and Folly" (1874); "Infancy" (1885); "The Elements," Salon of

Ministry of State, Louvre; "Presentation of the Virgin," Trinity Church, Paris.

LEVY, lā'vê, Jakob (1819-92). A Jewish Orientalist, born at Dobrzyze, in Posen. He was educated at Breslau; in 1845 became Rabbi at Rosenberg, and in 1850 went to Breslau, where he taught (1871-75) in a Jewish school and later in the university. His principal works are: *Chaldäisches Wörterbuch über die Targumim* (1867-68), and a *Neuhebräisches und chaldäisches Wörterbuch über die Talmudim und Midraschim* (1876 sqq.).

LEWAL, le-vȧl', Jules Louis (1823—). A French general. He was born in Paris; entered the army in 1846; served in the Italian campaign of 1859, with the French troops in Mexico (1862), and, after coöperation with Niel in the army reforms, in the Franco-Prussian War. He was promoted to brigadier in 1874; became head of the Military Academy three years after; in 1885 was Minister of War in Ferry's Cabinet; and in 1888 was appointed inspector-general. He wrote: *La réforme de l'armée* (1871); *Etudes de guerre* (1872 and 1890); *Tactique* (1875-83); *Stratégie de marche* (1893); and *Stratégie de combat* (1895 sqq.).

LEWALD, lā'vȧlt, August (1792-1871). A German author, born at Königsberg. He entered the Russian service at Warsaw, as secretary, during the War of Liberation. He became an actor, and after 1818 he was manager and director of theatres at Hamburg, Stuttgart, and elsewhere. In 1835 he founded at Stuttgart the periodical *Europa*, and afterwards became editor of the conservative *Deutsche Chronik*. A collection of his works, made by himself, was published in twelve volumes (1844-45), including the autobiographical *Aquarelle aus dem Leben* (1836-37 and 1840).

LEWALD, Fanny (1811-89). A German novelist and essayist, a cousin of August Lewald. She was born in Königsberg, of Jewish parents, but joined the Protestant Church when she was sixteen. Travel developed her powers of composition, and in 1841 she published her first novel in *Europa*, under the title *Der Stellvertreter*. Four years later, after travels in Italy, she settled in Berlin, where she maried Adolph Stahr (q.v.) in 1855. She wrote the novels: *Klementine* (1842); *Jenny* (1843); *Nella* (1870); *Die Erlöserin* (1873); *Neue Novellen* (1877); and *Stella*, which has been translated into English (1884). She also wrote sketches of travel, and the autobiographical *Meine Lebensgeschichte* (1861-63); and, treating the question of woman's rights, of which she was an ardent supporter, *Osterbriefe für die Frauen* (1863), and *Für und wider die Frauen* (2d ed. 1875). Consult Frenzel, *Erinnerungen und Strömungen* (Leipzig, 1890).

LEW-CHEW, LEW-KEW. See Loo-choo.

LEWENHAUPT, lā'ven-houpt, Adam Ludvig (1659-1719). A Swedish general. He was born near Copenhagen; studied at Upsala, Lund, Rostock, and Wittenberg; served in the Austrian army against the Turks, and under William III. in Holland; and in 1697 returned to Sweden. In the war waged by Charles XII. against Peter the Great and his allies he was intrusted with the defense of Courland, and defeated the enemy in several engagements (1703-05). Lewenhaupt fought bravely at Poltava in 1709, and after that disastrous battle was forced to surrender the remnant of the Swedish forces to the Russians. He was kept a prisoner in Russia, and he lived in Moscow until his death, in 1719. His memoirs, edited by his son-in-law, were published at Stockholm in 1757.

LEWES, lū'ĭs. The capital of Sussex, England, on the Ouse, 50 miles south of London, and 7 miles from Newhaven, its port (Map: England, G 6). It contains the ruins of a Cluniac priory founded in 1078, and a free grammar school founded and endowed in 1512. It has also a school of science and art, a free library, a county hall, and a town hall. There are large annual sheep fairs. Near Mount Harry-on-the-Downs occurred the battle of Lewes, in which Henry III. was defeated (May 14, 1264) by the insurgent barons under Simon de Montfort. Lewes is of remote origin. Roman coins have been discovered in the neighborhood, and there are traces of ancient mounds. It was a royal demesne of the South Saxon rulers, and mints were established there by Athelstan. Population, in 1891, 10,997; in 1901, 11,200. Consult: Horsfield, *History of Lewes* (2 vols., Lewes, 1824-27); Mantell, *The Ancient Town of Lewes* (London, 1846).

LEWES. A town in Sussex County, Del., about 35 miles southeast of Dover; on Delaware Bay, and on the Philadelphia, Wilmington and Baltimore Railroad (Map: Delaware, Q 5). It has a good harbor, artificially secured by a massive stone breakwater; is the headquarters of the Delaware Bay pilots; and exports large quantities of vegetables and fruit for Northern markets. Population, in 1900, 2259.

LEWES, George Henry (1817-78). An English author. He was born in London, April 18, 1817; was educated at various schools, entered upon a commercial career, studied medicine, and finally resolved to devote himself to authorship. In his twenty-first year he proceeded to Germany, where he remained for two years, studying the life, language and literature, and philosophy of that country. On his return to England he took up his residence in London, and began to write for the newspapers and magazines, till finally he became one of the most successful of littérateurs. Lewes edited with admirable talent the *Leader*, from 1849 to 1854; composed novels, comedies, and tragedies, and ultimately turned his active mind to the study of physiology and cognate branches of science, in which he won considerable repute. He married Agnes Jervis in 1840, but the union was unhappy and he separated from her in 1854 to live with Marian Evans (George Eliot) as man and wife. His principal works are: his *Biographical History of Philosophy from Thales to Comte* (1845), a new edition of which, much enlarged, was afterwards published; *The Spanish Drama, Lope de Vega and Calderon* (1846); *Comte's Philosophy of the Sciences*, a work which is not a mere translation of the French savant, but in several parts a complete remodeling; *Life and Works of Goethe* (1855); *Seaside Studies at Ilfracombe* (1858); *Physiology of Common Life* (1859); *Problems of Life and Mind* (1874-79); *On Actors and the Art of Acting* (1875). In 1865 Lewes founded the *Fortnightly Review*, and for a time was its editor. He died November 30, 1878. In philosophy he was a positivist. (See Positivism.) His *History* was written to prove the unattainability of metaphysical truth, although in his later writings he admitted the possibility of an empirical metaphysics.

LEWIN, lâ-vĕn′, Georg Richard (1820-96). A German physician, born at Sondershausen. He studied medicine in Berlin, Halle, Leipzig, Heidelberg, Vienna, and Paris, and was made professor of dermatology at Berlin in 1868. He was best known for his novel treatment of laryngitis and of syphilis, as set forth in *Die Inhalationstherapie in Krankheiten der Respirationsorgane* (2d ed. 1865) and *Die Behandlung der Syphilis durch subkutane Sublimatinjektion* (1869).

LEWIN, lū′ĭn, Thomas (1805-77). An English lawyer and biblical scholar. He was educated at Trinity College, Oxford; admitted to the bar in 1833, and in 1852 became conveyancing counsel to the Court of Chancery, and held the office the rest of his life. He wrote a standard treatise on *The Law of Trusts* (1837; 8th ed. 1885), but most of his works are of a religious character. Among them are: *The Life and Epistles of Saint Paul* (1851; 3d ed. 1875); an *Essay on the Chronology of the New Testament* (1854); *Jerusalem, a Sketch of the City and Temple from the Earliest Times to the Siege by Titus* (1861); *Siege of Jerusalem by Titus* (1863); and *Fasti Sacri, or a Key to the Chronology of the New Testament* (1868). He also published a work on Cæsar's invasion of Britain (1859).

LEWIS, lū′ĭs, Abram Herbert (1836—). An American clergyman of the Seventh-Day Baptist denomination. He was born at Scott, N. Y.; studied at Milton College, Wis., at Alfred University, N. Y., and Union Theological Seminary. He held charges in Westerly, R. I. (1864-67); in New York (1868); and in Plainfield, N. J. (1880); became professor of Church history at Alfred University in 1868; and wrote: *Critical History of the Sabbath and the Sunday in the Christian Church* (1866); *Sunday Legislation* (1888); and *Paganism Surviving in Christianity* (1890).

LEWIS, Agnes Smith. An English Orientalist, daughter of the Rev. John Smith. She was born at Irvine, Ayrshire, and was educated at the Irvine school and by private tutors. With her sister, Mrs. Margaret Dunlop Gibson, she discovered, in the library of the Convent of Saint Catherine on Mount Sinai, the Syro-Antiochene Palimpsest of the Gospels and other valuable Oriental manuscripts. The sisters gave the site for Westminster Theological College, Cambridge, in 1897. Her works include: *In the Shadow of Sinai* (1898); *The Story of Aḥiḳar* (with Conybeare and J. R. Harris, 1898); *A Palestinian Syriac Lectionary of the Gospels* (with Mrs. Gibson, 1899); and vols. i., vi., ix., x. of *Studia Sinaitica*, containing a *Catalogue of the Sinaitic Syrian Manuscripts* (1894); *A Palestinian Syriac Lectionary from the Pentateuch Prophets* (1897); and *Select Narratives of Holy Women*, from the same source (1900).

LEWIS, Andrew (c.1720-80). An American soldier. He was born in Donegal, Ireland, but in 1732 his family emigrated to America, and became the first white settlers within the limits of the present Augusta County, Va. Lewis served as a major under Washington in the Ohio expedition of 1754, and under Braddock, with the same rank, in 1755. In 1756 he commanded the Sandy Creek expedition against the Indians, and two years later was captured by the French near Fort DuQuesne, and taken as a prisoner to Montreal. He was Virginia's commissioner in the treaty negotiations with the Indians at Fort Stanwix (Rome, N. Y.) in 1768, and in 1774 served as brigadier-general in Lord Dunmore's War (q.v.), and as such commanded the Virginia troops at the battle of Point Pleasant (q.v.). He was a member for several years of the Virginia House of Burgesses, and in 1776 was appointed by Congress a brigadier-general, and took part in the military operations against Lord Dunmore. Ill health compelled him to resign his commission in April, 1777, and he died three years later in Bedford County, Va. His four brothers, Samuel, Thomas, William, and Charles, were also prominent in the history of Virginia.

LEWIS, Charlton Thomas (1834-1904). An American lawyer and lexicographer, born in West Chester, Pa. He entered Yale College, where he graduated in 1853. In 1854-56 he began to study for the ministry in the Methodist Church, but became instead professor of languages in the State Normal University, Bloomington, Ill., in 1857; and later (1860) professor of mathematics in Troy University, N. Y., and professor of Greek in the same institution in 1862. Three years afterwards he gave up teaching, and settled in New York City for the practice of the law. He spent the year 1867-68 in Europe on account of ill health; and on his return he became editor, with William Cullen Bryant, of the New York *Evening Post*. In 1871 he again resumed his law practice, and became counsel for many corporations. In 1898-99 he lectured on insurance before Columbia, Cornell, and Harvard universities. Among the many subjects which engaged his attention was that of prison reform. His principal published works are: *Gnomon of the New Testament*, translated from the German of Bengel (1861); *History of Germany* (1870); *Harper's Latin Dictionary*, in collaboration with Prof. Charles Short (1879-95); *Latin Dictionary for Schools* (1886); and *Elementary Latin Dictionary* (1890).

LEWIS, Dio (1823-86). An American physician, born at Auburn, N. Y. He studied at the Harvard Medical School, and practiced for a time successively at Port Byron and Buffalo, N. Y. At the latter place he published a monthly periodical, in which he advocated the hygienic value of diet and exercise. He introduced the system of light gymnastics for schools and private classes, and in 1863 founded in Boston a school for training teachers of physical culture. He removed to New York City about 1883. His principal publications are: *The New Gymnastics* (1862); *Weak Lungs and How to Make Them Strong* (1863); *Talks About People's Stomachs* (1870); *Our Girls* (1871); *Chats with Young Women* (1871); *Chastity* (1872); *Gypsies* (1881); and *In a Nutshell* (1883).

LEWIS, Edmonia (1845—). An American sculptor. She was born in New York, July 4, 1845, of negro and Indian parentage. She received little instruction in sculpture, but attracted attention by exhibiting a bust of Colonel Shaw at Boston in 1865. In the same year she went to Rome to study, and after 1867 made her residence there. Among her works are the

"Freedwoman;" "Death of Cleopatra," exhibited at the Centennial Exhibition (1876); "Asleep;" "Marriage of Hiawatha;" "Madonna with the Infant Christ." Among her portrait busts in terra-cotta are those of Longfellow, Charles Sumner, John Brown, and Abraham Lincoln, in the Library of San José, Cal. Her work is mostly in Europe.

LEWIS, ESTELLE ANNA BLANCHE (ROBINSON) (1824-80). An American poet. She was born near Baltimore, Md., and was married to Sidney Lewis of Brooklyn, N. Y., in 1841. From that time she lived chiefly in Europe. Her first verses appeared in New York as *Records of the Heart* (1844). Her later poems, which won extravagant praise from Edgar Allan Poe, include: *The Child of the Sea* (1848); *The Myths of the Minstrel* (1852); and *Poems* (1866). She also wrote three tragedies, *Helémah, or the Fall of Montezuma* (1864); *Sappho of Lesbos* (1868); and *The King's Stratagem* (1869). Of these *Sappho*, her best work, passed through seven editions, and after being translated into Greek was produced at Athens.

LEWIS, FRANCIS (1713-1803). An American patriot. He was born in Llandaff, Wales, and was educated at Westminster. After a mercantile apprenticeship he brought over a cargo of goods to America in 1735; settled in New York, and became a prosperous merchant. During the French and Indian War he was agent for clothing the British troops, was at Oswego when that post was surrendered to Montcalm by Colonel Mercer in 1756, and was taken prisoner and carried to France. On his return to New York, he gradually retired from active business. He was prominent among the 'Sons of Liberty'; was a member of the Continental Congress in 1775-76, and signed the Declaration of Independence. In 1776 his house on Long Island was plundered, his papers destroyed, and his wife taken prisoner. After much trouble she was finally exchanged.

LEWIS, Sir GEORGE CORNEWALL (1806-63). An English statesman and author, eldest son of Sir T. F. Lewis, of Harpton Court, Radnorshire. He was born in London, April 21, 1806. He was educated at Eton and at Christ Church, Oxford, where he was distinguished for classics and mathematics. He became a barrister in 1831, and after acting on various commissions of inquiry, succeeded his father as poor-law commissioner (1839-47). He sat in Parliament for Herefordshire from 1847 to 1852, and became successively Secretary to the Indian Board of Control, Under-Secretary of the House Department, and Financial Secretary to the Treasury. Losing his seat in 1852, he accepted the editorship of the Edinburgh *Review* (1852-55). Elected to Parliament for the Radnor Boroughs in 1855, he became, under Palmerston, Chancellor of the Exchequer (1855-58), Home Secretary (1859-61), and Secretary of War (1861-63). He died April 13, 1863. He wrote numerous articles for the magazines, especially for the Edinburgh *Review*, and published about twenty books on a great variety of topics. Among them are: *The Use and Abuse of Political Terms* (1832); *Origin and Formation of the Romance Languages* (1835); *Local Disturbances in Ireland* (1836); *A Glossary of Provincial Words Used in Herefordshire* (1839); *The Government of Dependencies* (1841); an edition of the spurious *Fables of Babrius* (1846); *The Influence of Authority in Matters of Opinion* (1849); *The Method of Observations and Reasoning in Politics* (1852); an *Inquiry into the Credibility of Early Roman History*, an attack on Niebuhr (1855); *Astronomy of the Ancients* (1862); and a *Dialogue on the Best Form of Government* (1863). Several of these works displaying solid learning have been reprinted. Consult the *Letters of G. C. Lewis*, edited by G. F. Lewis (London, 1870); and Bagehot, *Biographical Studies*, edited by Hutton (ib., 1881).

LEWIS, HENRY CARVILL (1853-88). An American geologist, born in Philadelphia. He studied at the University of Pennsylvania, graduated in 1873, and spent several years in graduate study. In 1879 he became connected with the Geological Survey of Pennsylvania, and in 1884 he published a *Report on the Terminal Moraine in Pennsylvania and New York*. A year afterwards he went to Europe to study glacial phenomena in England, Ireland, and Switzerland, and to take courses in petrology under Rosenbusch at Heidelberg. His early death broke off these researches, but their partial results were contributed to the British Association (1886-87). In 1880 he was made professor of mineralogy in the Philadelphia Academy of Natural Sciences, and three years afterwards was made professor of geology at Haverford College; both these chairs he held until his death.

LEWIS, JAMES (1840-96). An American comedian. He was born in Troy, N. Y., and made his first stage appearance there in 1858, his part being a minor one in *The Writing on the Wall*. At the outbreak of the Civil War he was in the South, and he narrowly escaped being detained there by the blockade. Subsequently, he traveled much in the Middle West. His first appearance in New York City was in 1866, in the farce *Your Life's in Danger*, as presented at the Olympic Theatre by Mrs. John Wood's company. Afterwards he was very successful in Boston in the rôle of Dick Swiveller. In 1869 he became the leading comedian in Augustin Daly's company in New York City, and he retained this position during the remainder of his life. He was highly successful in almost every comedy part that he played.

LEWIS, JOHN FREDERICK (1805-76). An English historical, genre, and animal painter. He was born in London, August 29, 1805. His first works were animal paintings, but after a journey through Germany and Italy, he devoted himself to aquarelles, becoming a member of the Water-Color Society in 1830. The scope of his art was enlarged by a visit to Spain in 1832-34, during which he painted only Spanish genre. After this he resided in Paris and Rome, and in 1840 he went to Greece and Constantinople, afterwards settling for ten years in Egypt. In 1851 he returned to England, where his aquarelles were received with much enthusiasm. His "Frank Encampment in the Desert of Mount Sinai" (1842) was considered by Ruskin the finest thing of its kind since Veronese. In 1856 he was elected president of the Water-Color Society, but resigned in 1858 to devote himself to oil painting. His oil paintings, treating Oriental subjects, sustained his previous reputation, and in 1865 he was elected Academician. He died at Walton-on-the-Thames, August 15, 1876. His paintings, especially the water-colors, show exquisite coloring, and careful finish of detail. Among his water-colors are: "Halt in the Desert" (1853, South Kensington Museum); "Bull Fight at Seville" (1836); "Christino Spy" (1837); "Easter Day at Rome" (1840); and the "Harem" (1851). His oils include a "Greeting in the Desert" (1856); "Bedouin Sheikh" (1861); "Door of a Café at Cairo" (1866, Royal Academy).

LEWIS, Matthew Gregory (1775-1818). An English romancer, nicknamed 'Monk' Lewis. He was born in London, July 9, 1775. His father owned valuable estates in Jamaica. Lewis was sent to Westminster School and thence to Christ Church, Oxford. In 1792 he went to Weimar, where he saw Goethe and acquired a knowledge of contemporary German literature. In 1794 he was appointed attaché to the British Embassy at The Hague; and from 1796 to 1802 he was in Parliament. In 1798 he made the acquaintance of Sir Walter Scott, who, then unknown, was glad to contribute to his *Tales of Wonder* (1801). In 1816 he visited Byron at Geneva, and again the next year in Florence and Venice. On the death of his father (1812), he inherited the estate and slaves in the West Indies. On the homeward voyage from a second visit to Jamaica, he died of yellow fever (May 14, 1818). Lewis won wide celebrity for his *Ambrosio, or the Monk* (1795), and was ever afterwards known as 'Monk' Lewis. It is a Gothic romance after the type of Ann Radcliffe's *Mysteries of Udolpho.* It contains, however, incidents taken from German romance, and thus becomes historically interesting as a thread connecting the literature of Germany and England. Owing to certain voluptuous passages, afterwards suppressed, the sale of the book was enjoined by the Attorney-General. A Gothic melodrama entitled *The Castle Spectre*, brought out at Drury Lane in 1798, ran for sixty nights, and long continued popular. After his death appeared the *Journal of a West Indian Proprietor* (1834), which was praised by Coleridge. The *Monk* has been often reprinted, though not usually entire. A second romance, *The Bravo of Venice* (1804), is in Cassell's National Library; and *The Tales of Wonder* and the earlier *Tales of Terror* (1799) were reprinted in Morley's Universal Library (1887). Consult: *The Life and Correspondence of Lewis* (London, 1839); and for Lewis's relation to German literature, Beers, *English Romanticism* (New York, 1898); and Brandl, *S. T. Coleridge und die englische Romantik* (Berlin, 1886; trans. by Lady Eastlake, London, 1887). See English Literature.

LEWIS, Meriwether (1774-1809). An American explorer, born near Charlottesville, Va. He came of a well-known Virginian family, and inherited from his father a comfortable estate, but at the time of the Whisky Rebellion in 1794 gave up farming to join the forces which the Government sent into western Pennsylvania, and at the close of the insurrection became an ensign in the Regular Army. Five years later he was promoted to the rank of captain, and in 1801 he became President Jefferson's private secretary. When in 1803 it was decided to send an exploring expedition into the Louisiana country, for which the United States was then negotiating with France, the President accepted the promptly offered services of his secretary. Lewis chose as his companion Capt. William Clark (q.v.), an old army friend. The party left the Mississippi in May, 1804, and proceeded up the Missouri to its headwaters, crossed the Great Divide, and, landing on one of the tributaries of the Columbia, followed it and then the Columbia to the Pacific. After a dreary winter on the coast they returned to the United States by much the same route, and reached Saint Louis in September, 1806. (See Lewis and Clark Expedition.) As a reward for this service Congress granted Captain Lewis a tract of 1500 acres of land from the public domain, and in 1807 the President appointed him Governor of Louisiana Territory, the northern part of the Louisiana Purchase, with headquarters at the village of Saint Louis. Here he soon proved himself an able administrator. In this latter work he was ably assisted by Captain Clark, who had been appointed Indian agent. His leisure moments were occupied with preparing for publication the account of his great journey; but this he was destined never to finish, for in 1809 he was called to Washington on business, and while on the way met his death in the cabin of a Tennessee pioneer. Whether his death was due to murder or suicide was not known. For biographical sketches, consult the works given under Lewis and Clark Expedition.

LEWIS, Morgan (1754-1844). An American soldier and jurist. He was born in New York City, the son of Francis Lewis (q.v.), graduated at Princeton in 1773, and, on the eve of the Revolution, began reading law in the office of John Jay. He joined the Continental Army before Boston soon after the battle of Bunker Hill, and later in the same year was commissioned captain in the Second Regiment of New York militia. In 1777 he was appointed quartermaster-general of Gates's army, and distinguished himself at Saratoga, and in 1779 he served with Sullivan and Clinton in the campaign in central New York. After the war he took up the practice of law, married into the Livingston family, and became prominent in Anti-Federalist politics. After a term in the Assembly and a short period on the bench of Common Pleas in Dutchess County, where he made his home, he was elected in 1791 by the council of appointment to succeed Aaron Burr as Attorney-General of the State. A year later he was appointed a judge of the New York Supreme Court, and in 1801 was made Chief Justice. In 1804 the Livingston faction secured his nomination for the office of Governor, and he was elected by a large majority over Burr. He was a strong supporter of Madison's war policy, and in 1812 was offered the portfolio of war. This he declined, but almost immediately accepted the post of quartermaster-general of the army, with rank of brigadier-general. On March 2, 1813, he was commissioned major-general and served on the Canadian frontier, being present at the battles of Fort George, Sackett's Harbor, and French Creek. In 1815 he resigned his commission, and the rest of his life he spent on his estates in Delaware County. For many years he was president of the New York Society of the Cincinnati, and in 1831 was elected grand master of the Free-Masons. Consult Delafield, *Biography of Francis and Morgan Lewis* (1877).

LEWIS, Tayler (1802-77). An American educator and author. He was born at Northumberland, Saratoga County, N. Y.; graduated at Union College in 1820; studied law in Albany, and practiced at Fort Miller; but relinquished his profession to devote himself to classical studies. He was appointed professor of Greek at the University of New York in 1838, and at Union in 1849. He was an able and conservative Christian apologete; a prominent exponent of classical study; and a political thinker of some ability, as may be seen from his *State Rights, a Photograph from the Ruins of Ancient Greece* (1864). He was a member of the Bible Revision Committee, and wrote: *The Six Days of Creation* (1855), continued by *The Bible and Science* (1856); and, together with E. W. Blyden and Timothy Dwight, *The People of Africa, Their Character, Condition, and Future Prospects* (1871).

LEWIS, or LEWIS FORK. The old name of Snake River (q.v.).

LEWIS AND CLARK EXPEDITION. In American history, an expedition, under the command of Meriwether Lewis (q.v.) and William Clark (q.v.), which in 1804-06 penetrated from the Mississippi River, through territory now forming parts of Missouri, Kansas, Nebraska, South Dakota, North Dakota, Montana, Idaho, Washington, and Oregon, to the Pacific Ocean. The members of the party were the first white men to cross the continent between the Spanish possessions to the south and the British possessions to the north. The expedition was sent out by President Jefferson for the purpose of exploring the Louisiana Territory, immediately after its purchase from France. As at first organized the party consisted of 29 members: Lewis and Clark, 14 regular United States soldiers, 9 Kentuckians who had volunteered, 2 French watermen, an interpreter and hunter, and a negro servant. At Saint Louis sixteen additional men were enlisted for the enterprise, to go, however, only part of the way. The party started from the vicinity of Saint Louis, Mo., on May 14, 1804; passed up the Missouri River; reached the mouth of the Platte on July 26th; arrived at the camps of the Mandans and Minnetarees, about 1600 miles distant from Saint Louis, late in October; wintered there; broke up winter quarters April 7, 1805, 14 men having been sent back to Saint Louis with collections and reports and two recruits having been gained; reached the mouth of the Yellowstone River, April 26th; and on May 26th sighted the Rocky Mountains. The three forks of the Missouri River were discovered on July 25th, and named Jefferson, Madison, and Gallatin. The party proceeded up the Jefferson; crossed the Rocky Mountains in September; started down the Columbia River on October 16th; and on November 7th came in sight of the Pacific Ocean. After wintering on the coast, they started on their return, March 23, 1806, and arrived at Saint Louis September 23, 1806, having traveled altogether a distance of almost 8500 miles. At times the explorers suffered terrible hardships, and from April, 1805, to August, 1806, were shut off from all communication with the world. Lewis and Clark collected a mass of valuable information concerning the physical characteristics, the fauna and flora, the climate, and the various Indian tribes of the territory traversed. For accounts of the expedition, consult: Jefferson, *Message from the President of the United States, Communicating Discoveries Made in Exploring the Missouri, Red River, and Washita by Captains Lewis and Clark, Dr. Sibley, and Mr. Dunbar* (Washington, 1806; various subsequent editions); Gass, *A Journal of the Voyages and Travels of a Corps of Discovery Under the Command of Captain Lewis and Captain Clark* (Pittsburg, 1807; several subsequent editions); and especially Allen (Biddle ed.), *History of the Expedition Under the Command of Captains Lewis and Clark to Sources of the Missouri, Thence Across the Rocky Mountains and Down the River Columbia to the Pacific Ocean* (2 vols., Philadelphia, 1814), which is based on the journals kept by Lewis and Clark themselves, and has been frequently reprinted, the best edition being the one edited by Coues, *History of the Expedition Under Lewis and Clark* (4 vols., New York, 1893). Consult also: Brooks (ed.), *First Across the Continent: Expedition of Lewis and Clark* (New York, 1901); and a brief sketch by Lighton, *Lewis and Clark* (Boston, 1901), in the "Riverside Biographical Series."

LEWISBURG, lū'ĭs-bûrg. A borough and the county-seat of Union County, Pa., 30 miles south by east of Williamsport; on the west branch of the Susquehanna River, and on the Pennsylvania and the Philadelphia and Reading railroads (Map: Pennsylvania, E 3). It is the seat of Bucknell University (Baptist), opened in 1846. The borough is the commercial centre for a fertile grain and general farming region, and has woolen, flour, and lumber mills, furniture and chair factory, machine-shop, acetylene gas works, a shirt-factory, etc. Population, in 1890, 3248; in 1900, 3457.

LEWISTON, lū'ĭs-ton. A city and the county-seat of Fulton County, Ill., 45 miles southwest of Peoria; on the Chicago, Burlington and Quincy and the Fulton County Narrow Gauge railroads (Map: Illinois, B 3). It has considerable trade in live stock and agricultural and dairy products; and manufactures flour, lumber, brick and tile, furniture, carriages and wagons, oil-cans, etc. Population, in 1890, 2166; in 1900, 2504.

LEWISTON. A city in Androscoggin County, Maine, 35 miles north of Portland; on the east bank of the Androscoggin River, opposite Auburn, and on a branch of the Grand Trunk and the Maine Central railroads (Map: Maine, C 7). Several bridges here span the river. The stream at this point falls fifty feet, affording fine waterpower, which is utilized by means of a distributing dam and canal, the system having been built at a cost of $1,000,000. The principal manufactures include cotton and woolen goods, cotton and woolen mill machinery, foundry products, boilers and engines, boots and shoes, belting, lumber products, carriages, furniture, and bricks. There are also extensive bleaching and dye works. Lewiston is the seat of Bates College (q.v.), and has a fine city hall, a public park, and the Manufacturers' and Mechanics' Library of 10,000 volumes, now located in the new Carnegie Library building, as well as the collegiate library. The government is vested in a mayor, annually elected, a bicameral council, and the usual administrative officials. Population, in 1890, 21,701; in 1900, 23,761. Settled in 1770 and called the 'Plantation of Lewiston' until 1795, when it was incorporated as a town, Lewiston was chartered as a city in 1863.

LEWISTON. A village and summer resort in Niagara County, N. Y., on the Niagara River, seven miles north of Niagara Falls; the terminus of a line of steamers to Toronto; on the New York Central and Hudson River Railroad (Map: New York, A 2). It has a public library. The Gorge Road, Rumsay Park, and the Tuscarora Indian Reservation are of interest in this locality. Population, in 1890, 633; in 1900, 697. A blockhouse was erected here by the French in 1720, but was soon abandoned, though an Indian village, later the home of Joseph Brant, grew up in the vicinity. Near it are Devil's Hole and Bloody Run—the scene of a terrible Indian massacre on September 14, 1763. The permanent settlement by the whites dates from about 1800; the township was set off from Cambria in 1818, and in 1843 the village was incorporated. In 1813 (December 19th) Lewiston was burned by the English and Indians. Consult Pool, *Landmarks of Niagara County, N. Y.* (Syracuse, 1897).

LEW'ISTOWN. A borough and the county-seat of Mifflin County, Pa., 61 miles northwest of Harrisburg; on the Juniata River, and on the Pennsylvania Railroad (Map: Pennsylvania, D 3). The borough bears some reputation as a summer resort, but is more important as an industrial centre. It is in a fertile farming district which has mineral deposits, particularly of iron and glass sand; and there are foundries, furnaces, steel-works, flour and lumber mills, a tannery, and manufactories of edge tools, pumps, hydrants, etc. Population, in 1890, 3273; in 1900, 4451.

LEWIS-WITH-HARRIS. A Scottish island, the northernmost of the outer Hebrides (q.v.), 30 miles northwest of Ross-shire, from which it is separated by the Minch (Map: Scotland, B 1). Area, 770 square miles. Population, in 1891, 30,700; in 1901, 34,224. The coasts are wild and rugged: the chief indentations are Broad Bay, and Lochs Erisort, Seaforth, Resort, and Roag. The surface is for a considerable portion swampy and covered with peat. Barley and potatoes are the principal crops raised. The inhabitants are of Celtic extraction, with the exception of a colony in the north, who, although they speak the Gaelic language, are of Scandinavian descent. Relics of antiquity and remains of ancient forests abound. Stornoway (q.v.), on the east coast, is the capital town.

LEX FORI. See CONFLICT OF LAWS; FORUM.

LEXICOGRAPHY. See DICTIONARY.

LEXICON. See DICTIONARY.

LEX'INGTON. A city and the county-seat of Fayette County, Ky., 98 miles south of Cincinnati, Ohio; on the Chesapeake and Ohio, the Lexington and Eastern, the Louisville and Nashville, the Queen and Crescent Route, the Southern, and other railroads (Map: Kentucky, G 2). It is the centre of the widely celebrated 'blue grass region,' is well built, and has a public library, the State Asylum for the Insane, Kentucky Reform School, Kentucky University (Christian), organized in 1836, State Agricultural and Mechanical College, Sayre Female Institute, Hamilton and McClelland female colleges, Saint Catherine's Academy (Roman Catholic), and other educational institutions. Other points of interest are Woodland Park, the race-tracks, and several noted stock farms. Lexington is commercially important as the market for the 'blue grass' district, and is well known also for the manufacture of Bourbon whisky. The manufactures include also flour, saddlery and harness, carriages and wagons, canned goods, and planing-mill, foundry, and machine-shop products. The government is administered under a charter of 1894, by a mayor, elected every four years, a bicameral council, and subordinate officials, the majority of whom are chosen by the people. Population, in 1890, 21,567; in 1900, 26,369.

In 1775 several hunters, including Robert Patterson, Simon Kenton, and William McConnell, stopped on the site of Lexington, gave it its present name to commemorate the battle of Lexington, and built a cabin to confirm their title to the land. A permanent settlement was made by Patterson four years later. In 1782 the town was incorporated by the Virginia Legislature. From 1792 to 1793 it was the capital of Kentucky, and here, in 1792, assembled the first State Legislature. In 1832 a city charter was secured. It was the home from 1797 until his death of Henry Clay, in memory of whom a noteworthy monument has been erected.

LEXINGTON. A town in Middlesex County, Mass., 11 miles northwest of Boston; on the Boston and Maine Railroad (Map: Massachusetts, E 3). Among the points of interest are the Cary Library, with 20,000 volumes, and fine marble statues of John Hancock and Samuel Adams; a statue of Captain Parker; the battle-ground; the Revolutionary monument, erected in 1799; the Hancock-Clarke house (built in 1698), where Hancock and Samuel Adams slept the night before the battle of 1775, and now the repository of an interesting collection of relics; Monroe Tavern (built in 1695), Earl Percy's headquarters; Buckman Tavern (built 1690), the rendezvous of the minutemen; the old Belfry club-house; the town hall; the high school; the Hancock schoolhouse; and the old burying-ground. The leading industries are farming and dairying, and the manufacture of leather binding. Population, in 1890, 3197; in 1900, 3831. Settled in 1640, Lexington was a part of Cambridge and was known as 'Cambridge Farms' until 1691, when it was made into a separate precinct, and given its present name from Lord Lexington. It was incorporated as a town in 1713. It was the birthplace of Theodore Parker.

Lexington is celebrated in American history for having been the scene of the first contest in the Revolutionary War, fought April 19, 1775. On the night of April 18th the Americans discovered the intention of General Gage to send a detachment of British troops to Concord for the purpose of destroying some military stores which had been collected there, and also to seize the persons of John Hancock and Samuel Adams, who were living temporarily in Lexington. Information of this design was spread abroad by Paul Revere, who rode from Charlestown to Lexington warning the farmers along the route. On the same evening General Gage, who commanded the Royal troops in Boston, had picketed the roads in the vicinity and dispatched Lieutenant-Colonel Smith with 800 men on the expedition to Concord. When the advance of the British column reached Lexington in the early morning it was opposed by about 70 militiamen, who had formed on the town common, under command of Capt. John

Parker. The British were commanded by Major Pitcairn, who, on observing the preparations made to resist his progress, halted his men to load, and then advanced at double-quick, he himself riding in front and ordering the Americans to lay down their arms and retire. As the militia held their ground, Major Pitcairn fired his pistol at them, and having given the order to his men, the latter discharged their muskets, with the result of killing four and wounding nine of the militiamen. The latter retreated, four being killed while fleeing. A scattering fire from Captain Parker's men wounded three British soldiers, and the militia being dispersed, the British force proceeded to Concord to effect the main object of the expedition. The distance is only about six miles, and the place, which became the second battleground of that day, was reached at about 7:30 o'clock. The country was by this time thoroughly aroused, and as many as 180 militiamen had assembled, who, as the British came into view, fell back and took position on the side of a hill, afterwards crossing the North Bridge over the Concord River by order of Colonel Barrett, who had assumed command. The British, being left in possession of the town, proceeded to the destruction of such arms and provisions as they could find, a detachment being sent to gain control of the North and South bridges. This body was attacked by the militia at the North Bridge, and a brisk fight followed, which resulted in slight losses on both sides. The British, having effected all the damage possible, commenced to retreat, being followed by the Americans, who kept up a galling fire and harassed them. The timely arrival of a large force under Lord Percy prevented a disaster. The news of these encounters thrilled the country and impressed the Americans with a sense of their own capability to contend with the tried regulars of the British Army.

LEXINGTON. A city and the county-seat of Lafayette County, Mo., 40 miles east of Kansas City; on the south bank of the Missouri River, and on the Atchison, Topeka and Santa Fé and the Missouri Pacific railroads (Map: Missouri, C 2). It has the Wentworth Military Academy, Central Female College, and Baptist Female College. The city is the centre of a hemp-growing region; and coal is mined in the vicinity and extensively shipped. The government is administered under a charter of 1848, subsequently amended, by a mayor, elected biennially, and a unicameral council. Lexington was settled in 1825, and incorporated about five years later. Population, in 1890, 4537; in 1900, 4190. There is a hill to the northeast of the city, where in September, 1861, 3000 Union soldiers, under Col. James Mulligan, sustained a siege against 18,000 Confederates under Gen. Sterling Price, at last surrendering the town and garrison on the 20th. A few days later Price withdrew, leaving only a small garrison, and on October 16th, a Union force of about 230 under Major J. White released the Union prisoners here and captured about 70 of the Confederates.

LEXINGTON. A town and the county-seat of Rockbridge County, Va., about 45 miles northwest of Lynchburg; on the north fork of the James River, and on the Chesapeake and Ohio Railroad and a branch of the Baltimore and Ohio Railroad (Map: Virginia, E 4). It has picturesque surroundings, and is the centre of a fertile agricultural region. There are some manufactures. The town is the seat of Washington and Lee University (q.v.), and of the Virginia Military Institute, founded in 1839. Among objects of special interest are the statues of Generals Lee and Jackson, whose graves are also here. The famous Natural Bridge (q.v.) is 14 miles south, and in the opposite direction are several mineral springs which have become popular resorts. Lexington owns and operates its water-works. Population, in 1890, 3059; in 1900, 3203.

LEX'IS, WILHELM (1837—). A German political economist, born at Eschweiler, near Aix-la-Chapelle. He studied mathematics and natural science at the University of Bonn, and in 1861 went to Paris, where the economics of France chiefly claimed his attention. He was appointed professor of political economy at the University of Strassburg in 1872, and accepted a call to the chair in the same branch at Dorpat in 1874, at Freiburg in 1876, at Breslau in 1884, and at Göttingen in 1887. A partial list of his writings includes: *Einleitung in die Theorie der Bevölkerungsstatistik* (1875); *Zur Theorie der Massenerscheinungen in der menschlichen Gesellschaft* (1877); *Die Wirkung der Getreidezölle* (1889); *Der gegenwärtige Stand der Währungsfrage* (1896); *Die neuen französischen Universitäten* (1901). In collaboration with others he edited *Handwörterbuch der Staatswissenschaft* (7 vols., 2d ed., Jena, 1898-1901).

LEX LOCI. See CONFLICT OF LAWS.

LEYDEN, or **LEIDEN,** lī'den. One of the oldest and most famous cities of the Netherlands, situated in the Province of South Holland, on several arms of the Old Rhine, 22 miles southwest of Amsterdam and six miles inland (Map: Netherlands, C 2). It is a regularly built town, and is too large for its present population. Of its churches the most noteworthy are Saint Pancras (Hooglandsche Kerk), a fine late Gothic building originally erected in the fifteenth century and restored in 1885; and the Church of Saint Peter, dating from 1315, and containing many monuments to distinguished scientists. The sixteenth-century town hall in Dutch style, and the Lakenhal ('cloth hall') or Municipal Museum, dating from the seventeenth century, are the most prominent secular buildings. On an elevation in the centre of the town are the ruins of the old Burg. Besides its university (see LEYDEN, UNIVERSITY OF), to which it chiefly owes its fame, Leyden has a gymnasium, two other high schools, and a navigation school. Leyden was the birthplace of Rembrandt. In the fifteenth century its textiles were famous throughout Europe. The chief manufactures are various woolen products, cotton goods, leather, iron products, and spirits. There is a considerable trade in local manufactures and dairy products. The population of Leyden is believed to have been about 100,000 in the eighteenth century. In 1900 it was 54,421.

The most brilliant event in the history of Leyden was its heroic defense against the Spaniards, who besieged the city for a whole year—1573-74. The citizens withstood the siege almost to the last point of endurance, when William of Orange at last relieved them by opening the dikes and flooding the country. From 1609 to 1620 Leyden was the place of refuge of a band of English Non-Conformists from among whom came the

'Pilgrims' who founded Plymouth Colony. In 1807 a large section of the most beautiful quarter of the city was laid in ruins by the explosion of a powder-ship in the river. This part is now occupied by a park.

LEYDEN, Ernst von (1832—). A German physician, born at Danzig, and educated in Berlin at the Friedrich Wilhelm Institute. From 1854 to 1865 he served as military surgeon; then became professor at Königsberg; in 1872 went to Strassburg; and in 1876 succeeded Traube in Berlin. His publications include: *Zur Pathologie des Tetanus* (1863); *Ueber Reflexlähmungen* (1870); his great work *Klinik der Rückenmarkskrankheiten* (1874-76); and many contributions to the *Zeitschrift für klinische Medizin,* which he founded in 1879 with Frerichs.

LEYDEN, John (1775-1811). A Scottish poet and Orientalist. He was born of poor parents at Denholm in Roxburghshire, Scotland, September 8, 1775. After a course of study during which he learned several European and Oriental languages, he was licensed as a preacher of the Church of Scotland. His first work (1799) was *A Historical Account of the Discoveries and Settlements of Europeans in Northern and Western Africa.* He contributed poems and translations to the *Edinburgh Magazine,* wrote for Lewis's *Tales of Wonder,* helped Scott to get materials for his *Minstrelsy of the Scottish Border,* and edited the *Scots Magazine* for a year. He then studied medicine and sailed for India in 1802. Ill health forced him to leave his station at Madras and go to Penang, where he studied the Indo-Chinese tribes. He was successively professor and judge at Calcutta. When the expedition to Java was undertaken, Leyden accompanied it. He died at Batavia, August 28, 1811. His chief work is the *Essay on the Languages and Literatures of the Indo-Chinese Nations,* in the *Asiatic Researches.* His collected poems were published in 1819; a new edition, *Poems and Ballads,* in 1858, with memoir by Scott; and two centenary editions in 1875.

LEYDEN, Lucas van. See Lucas van Leyden.

LEYDEN, University of. A Dutch university founded in 1575 by the provinces of Holland and Zealand, under the patronage of William the Silent, Prince of Orange, as one of the rewards to the citizens of Leyden for the heroic defense of the place against the Spaniards. From the beginning it was a centre of Protestant learning, and drew to itself many English Puritans and French Huguenots. In 1807 it was raised to the rank of a royal university, but with the annexation of Holland to France it sank to the grade of an academy, forming part of the University of France. After the reorganization of the universities by William I., in 1815, it lost ground, but was again reorganized in 1878 on an equality with the royal universities. It numbered in 1902 some 950 students, chiefly in law and medicine. Its library, founded in 1575, contains some 190,000 volumes, 3000 maps, 3400 Oriental and 3000 other manuscripts.

LEYDEN JAR. See Electricity; Condenser.

LEYDIG, lī'dĭk, Franz von (1821—). A German zoölogist, born at Rothenburg-an-der-Tauber. He studied medicine at Warzburg and Munich; was made professor at Tübingen in 1857, and in 1875 at Bonn; and retired in 1895. His more important works include: *Anatomisch-histologische Untersuchungen über Fische und Reptilien* (1853); *Der Eierstock und die Samentasche der Insekten* (1866); *Die augenähnlichen Organe der Fische,* on a supposed sixth sense (1881); and *Zelle und Gewebe* (1885).

LEYS, līs *or* lā, Hendrik, Baron (1815-69). A Belgian historical and genre painter. He was born at Antwerp, February 18, 1815. In 1829 he studied with Ferdinand de Braekeleer, his brother-in-law, and later with Wappers, at the Antwerp Academy. He received the great gold medal at the Brussels Academy in 1835; the next four years he studied in Paris. There he was strongly influenced by the French Romanticists, although some of his work of the same period shows the influence of Rembrandt and Van Dyck. In 1839 he visited Holland, where he took up the manner of the Dutch genre painters. His "Dutch Church Service," "Dutch Society of the Seventeenth Century," both in the National Gallery, Berlin, and "Wedding of the Seventeenth Century" (1845) contain such rich details, both in costume, decoration, and treatment of draperies, as are found in a Pieter de Hoogh, or a Metsu. The years 1852, 1859, 1863, he spent in Germany; and during the time he was strongly influenced by Dürer and Cranach. To this period belong "Erasmus in His Study" (1853), "Luther as Chorister in Eisenach," "Luther's Home in Wittenberg" (1858). He was the recipient of many honors, and his death, August 18, 1869, was marked by universal mourning in Antwerp. A statue was erected to his memory on the Boulevard Leys.

Leys was a fine colorist, and a good draughtsman, in his first style showing delight in careful detail, while in his second style his work is as severe in outline as the paintings of the fifteenth and sixteenth centuries, with the simplicity of the early Flemish and German masters, even to their faults in drawing. Among his most important works are the following: "Little Musician at a Peasant's Cottage" (1832); "Strand of Antwerp" (1834); "Rembrandt's Studio" (1837); "Family Festival in Brittany" (1838); "Courtyard of an Inn" (1842); "Restoration of Divine Service in Antwerp Cathedral" (1845); "Studio of Frans Hals" (1868); "Oath of Charles V." (1869); "Dürer Painting Erasmus" (1857); "Portrait of Quentin Massys" (1863); four scenes from the history of Antwerp, and portraits of 12 princes celebrated in connection with the city (1864-69). City Hall, Antwerp. Consult Sulzberger, *Henri Leys* (Brussels, 1835).

LEYTE, lā'tā. An island of the Visaya group in the Philippines, constituting with a number of small dependent islands the Province of Leyte (Map: Philippine Islands, J 9). It is situated to the southeast of Luzon, and is separated from the island of Samar on the northeast by the Strait of San Juanico, from 1 to 3 miles wide, and from Mindanao on the southeast by the Strait of Surigao (q.v.). The principal dependent islands are, Biliran, 22 miles long by 14 broad, off the north coast; Panaón, 20 miles long by 5 broad, off the southeast coast; and the Camotes, a group of three islands 20 miles from the west coast. The island of Leyte has an extreme length from northwest to southeast of 120 miles, and an extreme width of 45 miles. Its area is 3872 square miles; with the dependent islands, 4214 square miles, or nearly as large as Connecticut.

It has a roughly rectangular shape with a large bay indenting each of the four sides, and a number of smaller inlets forming in several places excellent harbors, such as that of Tacloban (q.v.). The coasts are as a rule clear, with deep water close inshore, except along the northwestern end, where there are reefs and shoals. The eastern coast is high and steep, the western low and sandy, interrupted by a number of rocky headlands. The interior is generally mountainous; an irregular chain with a number of peaks runs parallel with the western coast, about six miles inland, and reaches in Mount Sacripante a height of 3930 feet. There are several extinct volcanoes, some of which are over 4000 feet high. The rivers of Leyte are numerous, but are as a rule small mountain torrents. The chief among them are the Bao and the Leyte, both in the northwestern part. There is only one considerable lake, the Laguna de Bito, five miles long by three broad, situated near the centre of the island.

The climate of Leyte is temperate and healthful; the extreme annual temperatures are 52° F. lowest, and 86° F. highest. The island is abundantly watered and very fertile. Large parts of it are covered with forests, in which one of the predominant species is the Dammar pine, from which great quantities of pitch are produced; these forests also yield some of the finest hard woods of the archipelago. The numerous broad valleys are among the best cultivated lands of the Philippines, and yield abundant crops of hemp of an excellent quality, besides sugar, rice, coffee, cotton, and corn. The production of hemp in the island in 1896 amounted to 359,346 piculs (1 picul = 137.9 pounds); it declined during the war with Spain, but with the reëstablishment of peace the output is growing. The mineral wealth of Leyte includes gold, silver, iron, lead, and sulphur, only the last mentioned being mined to any extent. The leading industries consist in the manufacture of hempen fabrics and cocoanut oil. Shipbuilding is also an important industry, the large shipyards of Tacloban employing several hundred persons. The population was estimated in 1902 at 270,490, almost all of whom are Visayans, speaking the Visayan language. They are intelligent and industrious and show great interest in American institutions.

Leyte was first seen by Magellan in 1521. Its original name was Abuyog, and the Spaniards called it first Filipina, which name was later extended to the whole archipelago. Civil government under American rule was instituted on April 22, 1901, and the inhabitants showed such a friendly attitude toward the new régime that before the end of the year most of the island was intrusted to the native constabulary.

LEYTON, lā'*ton*. A town in Essex, England, a London suburb, five and one-half miles northeast of Saint Paul's (Map: London, D 8). It is distinguished for its municipal progress, owning an electric-light plant, an economical and efficient sewerage system, free libraries, a fine technical institute, opened in 1896, and an isolation hospital. Roman remains have been found here. Population, in 1891, 63,100; in 1900, 98,900.

LEZE MAJESTY. See TREASON.

LHASA, LASSA, or **H'LASA** (Tibetan *Lhā-Sā* 'God's place or house;' in Chinese, *Fŏ-fi*, 'Buddha Land'). The capital of Tibet, and the chief seat of the Lamaistic hierarchy; situated on the right or north bank of the Kyi-ch'u, a left-bank tributary of the Yaru-Tsang-pu or Brahmaputra, in an elevated plain (11,580 feet above sea-level), sometimes called Wo-ma-t'ang or 'milk plain,' sloping to the north for about 12 miles, and surrounded by lofty, barren mountains. The city is small, but regularly laid out; the principal streets are wide, well lined with Tibetan, Chinese, and Nepalese shops, and comparatively clean, but the back streets are exceedingly filthy. The principal buildings are of stone, but there are many of adobe and sun-dried brick. The chief trade is in precious stones, gold, velvet, cashmere, and other fabrics peculiar to the region; and in tea from China, silk, lace, carpets, Russian goods, musk, etc. The chief interests of the city, however, are religious; thousands of pilgrims visit it annually from Mongolia, Kashmir, Nepal, etc., and Buddhist temples and monasteries abound. Near its centre stands the cathedral, a lofty, flat-roofed shrine, resplendent with green and gold, known as the Jo-K'ang or Lha-K'ang, the 'House of the Lord,' surrounded with conventual houses and gardens. Here stands a life-size image of Buddha as a prince, about 16 years of age, said to have been cast during his lifetime in Magadha, the Buddhist Holy Land. The material is described as an alloy of five precious metals. It is surrounded by many others representing bodhisattvas, saints, and historical personages, the chief of which are Manju-sri, the god of wisdom, and Maitreya, the coming Buddha.

In the suburbs to the west of the city is the palace of the Dalai Lama, the head of the Lamaist Church, and the incarnation of Avalokiteshvara (see KWAN-YIN), an imposing pile of lofty buildings gorgeous in green and cinnabar, perched on the rocky hill, called by its founder Mount Potala, which rises from the plain to a height of 375 feet. A replica of the palace was erected in Jehol (q.v.), in Eastern Mongolia, by the Emperor K'ien-lung. These buildings date from 1643, and are well described by Huc and Gabet, who visited the city in 1846. To the south of this, also on a rocky hill, is the pavilion used by the Teshu-Lama, of Tashi-lun-po, when he visits the city. Other great monastic establishments in the neighborhood are Depung, 3 miles west, with 7000 monks and students, and 1½ miles north; Sera, sheltering 5500 monks, taking its name from three large temples gilt all over within, *ser* being the Tibetan word for gold. The population of Lhasa is not certainly known. The most reliable estimates make it 45,000, of whom 30,000 are monks and 15,000 laymen, not reckoning a Chinese garrison (2 miles distant) of 2700 men. The affairs of the city, as of Tibet, are in the hands of the Dalai Lama and the Chinese Amaban or Minister Resident.

Since the end of the eighteenth century foreigners have been forbidden to enter the city. Among the few who succeeded in entering it were Manning, in 1811; Huc and Gabet, in 1846; Nain Singh, an Indian surveyor, in 1874; and Sarat Chandra Dass, in 1882. See Huc and Gabet, *Souvenirs d'un voyage en Tartary, le Thibet et la Chine* (Paris, 1852; Chicago, 1900); Rockhill, "Tibet from Chinese Sources," in the *Journal of the Royal Asiatic Society* (London, 1891); Waddell, *The Buddhism of Tibet* (London, 1895); Sarat Chandra Dass, *A Journey to Lhasa* (Calcutta, 1885).

LHERMITTE, lâr'mēt', LÉON AUGUSTIN (1844—). A French painter, born at Mont Saint Père (Aisne). He studied under Lecoq de Boisbaudran, and received a medal of honor at the Paris Exposition of 1889. His subjects are genre, generally peasant scenes. An excellent picture of his in this manner is "The Vintage" (1884), which is in the Metropolitan Museum in New York City. His "Harvester's Wages" (1882) is in the Luxembourg.

LHERZOLITE, lẽr'zō-līt (named from Lherz, in the Pyrenees). An igneous rock of the peridotite (q.v.) family, of which the essential minerals are olivine, diallage, and an orthorhombic pyroxene.

L'HÔPITAL, lō'pē'täl', GUILLAUME-FRANÇOIS-ANTOINE DE, Marquis de Sainte-Mesme and Comte d'Entremont (1661-1704). A French mathematician, born in Paris, the son of Gen. Anne-Alexandre de L'Hôpital. He early displayed remarkable mathematical ability, solving at the age of fifteen certain problems on the cycloid proposed by Pascal. For a short time, he studied with Johann Bernoulli, when the latter was in Paris. He entered the army and served for some time as captain of cavalry, but his extreme myopia compelled him to relinquish his chosen profession. The rest of his life was devoted to mathematics. He was one of the first to put into intelligible language the Leibnitzian theory of the calculus. In 1693 he was made honorary member of the Academy of Sciences of Paris, and soon thereafter added to his reputation by a number of important discoveries in the new analysis. He found the curve whose tangents, terminated by the axis, are proportional to the segments of the axis intercepted between the curve and the tangent, solved the problem of the brachistochrone. His first great work, and the first treatise to popularize the new calculus, was the *Analyse des infiniment petits pour l'intelligence des lignes courbes* (1696, and numerous subsequent editions). He died of apoplexy before the publication of his second work, *Traité analytique des sections coniques* (1707; English ed. 1723). His numerous memoirs on mathematical subjects are to be found in the *Recueil de l'Académie des sciences* (1699-1701), and in the *Acta Eruditorum* (1693-99).

L'HÔPITAL, MICHEL DE (1507-73). A French statesman, born at Aigueperse, in Auvergne. He was the son of the Constable de Bourbon's physician. Implicated in the disgrace of the Constable, young L'Hôpital was imprisoned for a time in 1523, but eventually escaped to Italy, where at Padua and Bologna he completed the law studies begun at Toulouse, and accepted a civil office at the Papal Court in Rome. On returning to France, in 1537, he soon became a counselor in the Parlement of Paris, and was employed on various diplomatic missions, and through successive offices he gradually rose to be Chancellor of France in 1560. It was with the aid of Catharine de' Medici, and in opposition to the Guises, that he was thus elevated, and the policy he inaugurated was one of tolerance and conciliation toward the Huguenots. The Prince of Condé was pardoned; meetings of the Notables and of the States-General were held; and the important ordinance of Orléans (1561) marked a step forward in the development of the State in that it abolished the Concordat of Francis I., did away with many feudal abuses, and reformed the judiciary. On the accession of Charles IX., in 1560, L'Hôpital obtained pardon for many of the condemned Huguenots, and in September, 1561, arranged the famous conference at Poissy between leading Catholic and Protestant theologians for the purpose of effecting a reconciliation between the two parties. The contending factions, however, failed to come to any agreement, and the failure of the conference only widened the breach and made recourse to arms inevitable. During the civil war that followed, L'Hôpital continued his administrative reforms, and in 1566 put forth the Ordinance of Moulins, which was designed to protect the royal domains and to reform the magistracy and courts of France. Two years later the great Chancellor was forced from active office by the change in the policy of Catharine de' Medici and the hatred of the Guises and the Ultramontanes. He quitted the Court in May, 1568, but it was not until February 1, 1573, that he was compelled to resign the Chancellorship. He died March 13, 1573. He was an author of some note, and wrote Latin verses. His works, which were published under the title *Œuvres complètes de Michel de L'Hôpital* (5 vols., Paris, 1824), edited by Dupuy de l'Yonne, contain much that is of interest for the history of France in the sixteenth century. For his life, consult: Villemain, *Vie de L'Hôpital* (Paris, 1874); Dupré-Lasale, *Michel de L'Hôpital* (Paris. 1875); Scitte, *Un apôtre de la tolérance au XVIème siècle: Michel de L'Hôpital* (Montauban, 1891); Fournier de Flaix, *L'Hôpital, son temps et sa politique* (Paris, 1900).

LI, lē. The name of a Chinese measure of length. The li = .77 kilometer = .358 (rather more than one-third) English mile.

LIABILITY. In the broadest sense, any obligation enforceable at law or in equity, including legal obligations to perform acts other than the payment of money. The term is generally used, however, in a narrower sense as meaning a legal obligation to pay money: either a sum certain due and owing, as in the case of a debt, or an unliquidated sum, as in case of damages due upon tort or upon breach of contract. The source of all legal liability is either contract (q.v.), quasi-contract (q.v.), or tort (q.v.). The term under the civil law is not applicable to responsibility under the criminal law. Parsons, *Law of Contracts;* Pollock, *Law of Torts*. See CONTRACT; QUASI-CONTRACT; TORT; DEBT; EMPLOYER'S LIABILITY; LIMITED LIABILITY.

LIADOFF, lē'ȧ-dōf, ANATOLE (1855—). A Russian composer and conductor, born at Saint Petersburg. He was educated at the Saint Petersburg Conservatory, where he was subsequently professor of harmony, and in 1894 became conductor of the Saint Petersburg Musical Society. His compositions, although of unquestioned originality and charm, are technically very difficult. They include *morceaux*, *arabesques*, *intermezzi*, and considerable chamber and instrumental music.

LIAKHOV, lē'ȧk-ōf. A group of islands in the Arctic Ocean. See NEW SIBERIA.

LIANAS, lī-ā′naz (Fr. *liane*, creeper, from *lier*, to bind, from Lat. *ligare*, to bind). Plants which climb, whether by twining or by means of tendrils or other structures. While climbing plants are found in all parts of the world to a greater or less degree, their peculiar home is in the rich tropical forests. There they form dense jungles among the trees, in some cases making passage almost impossible. The various methods by which plants climb may be briefly mentioned. Some forms twine about the stem of the host plant, as the morning-glory and the bittersweet; others climb by means of tendrils, as the grape and the pea; still others by means of rootlets, as various ivies. Some plants which have one or more of these means for climbing also have thorns which in a measure help to secure attachment to the branches of the host; various greenbriers well illustrate this. Whatever may have been the original cause of the liana habit, their advantage is somewhat clear, inasmuch as they are able to grow up to the light in a comparatively short time and at a comparatively slight cost. Lianas often show structures which seem to adapt them well to their life conditions. Among these perhaps the most conspicuous are the mechanical tissues and the conducting tissues, both of which attain a very high degree of development.

LIAO-TUNG, lē-ou′tụng′ (Chin., River-east). A name originally applied to that portion of Southern Manchuria which lies to the east of the river Liao—that on which the port of Niuchwang is situated, the portion to the west being known as Liao-si. The name now includes both, and is nearly synonymous with Shing-king. The term has sometimes been restricted, wrongly, to the peninsula on which Port Arthur is situated, sometimes called the 'Regent's Sword.'

LIAR, THE. A farce by Foote, founded on Corneille's *Le menteur*. It was produced in 1761.

LIAS′SIC SERIES (Fr. *lias*, OF. *liais*, *liois*, from Bret. *liach*, *leach*, Welsh *llech*, Gael., Ir. *leac*, stone). The lower division of the Jurassic system. The formation is of special importance in Western Europe; in the United States Liassic rocks occur only in California and Oregon. In England the rocks comprise clays, sands, and limestones, aggregating more than 1000 feet in thickness, and divisible into three stages: Lower, Middle, and Upper Lias. Fossil remains are abundant, and include among the higher forms Ichthyosaurus, Plesiosaurus, Dimorphodon (qq.v.), and other reptiles. See JURASSIC SYSTEM.

LIBA′NIUS (Lat., from Gk. *Λιβάνιος*, A.D. 314-393). One of the latest and most eminent of the Greek sophists or rhetoricians. He was born at Antioch, in Syria, studied at Athens under various teachers, and first set up a school in Constantinople, where his prelections were so attractive that he emptied the benches of the other teachers of rhetoric, who had him brought before the prefect of the city on a charge of 'magic,' and expelled. He then proceeded to Nicomedia, but after a residence of five years was forced by intrigues to leave it, and returned to Constantinople. Here, however, his adversaries were in the ascendent; and after several vicissitudes, the sophist, broken in health and spirit, settled down in his native city of Antioch in 354, where, after a long career as a teacher, he died. Libanius was the instructor of Saint Chrysostom and Saint Basil, who always remained his friends, though Libanius was himself a pagan. He was a warm friend of the Emperor Julian, who corresponded with him. His works are numerous and mostly extant, consisting of orations, declamations, narratives, letters, etc. The most complete edition of the orations and declamations is that by Reiske (4 vols., Altenburg, 1784-97), and of the letters by Wolf (Amsterdam, 1738). No complete English translation of the works of Libanius exists, but sixteen of his letters to Julian have been translated by Duncombe, *The Works of the Emperor Julian*, i., pp. 303-332 (3d ed., London, 1798); and the monodies *On Nicomedia* and *On the Temple of Apollo at Daphne* are published by the same author (ii., pp. 227-251). Libanius's *Funeral Oration on the Emperor Julian* is translated by King, *Julian, the Emperor* (London, 1888). Consult: Petit, *Essai sur la vie et la correspondance du sophiste Libanius* (Paris, 1866); and Sievers, *Das Leben des Libanius* (Berlin, 1868).

LIB′ANUS, MOUNT. See LEBANON, MOUNT.

LIBATION (Lat. *libatio*, from *libare*, Gk. *λείβειν*, *leibein*, to pour out; the commoner Latin noun, however, is *libamen*). Anything *poured out* for the gods, as an act of homage or worship; a drink-offering. Such a libation was usual among the ancient Romans as a part of the sacrifice at an altar, and at home, at the beginning of meals or banquets, in homage to the *lares* or household gods. The term 'libation' has often also a wider significance, including not only the wine poured upon the altar, but often the little sacrificial cake, *libum*, that was placed there.

LIBAU, lē′bou (Russ. *Libava*). A fortified seaport in the Province of Courland, Russia, on the Baltic. It is situated on the end of a sandy tongue of land which separates Lake Libau from the sea (Map: Russia, B 3). Libau is well built, and consists of the old and the new town; in the latter are the large factories, the grain elevators, mills, etc. Libau has a number of churches, two gymnasia, a high school for women, a naval school, a public library, a hospital, and a number of other educational and charitable institutions. It has also a large public garden. The industries, formerly unimportant, have greatly increased, the principal articles of manufacture being farm machinery, flour, timber, sails, ropes, and furniture. There is an extensive export trade in eggs, flour, flax, spirits, petroleum, and notably grain. Libau is connected directly by rail with the wheat regions of the Empire. Its artificial harbor, which is but seldom frozen, is visited annually by about 2000 vessels, including about 1350 from foreign ports. Important harbor improvements were undertaken in 1893, and their completion in 1904 will make Libau both an important naval station and a great commercial port. Population, in 1897, 64,500, 25 per cent. being Jewish. Libau is a popular bathing resort. As a seaport it is first mentioned in 1263 under the name of Portas Liva. It was fortified by the Livonian Knights in 1301, and passed to Russia in 1795.

LIB′BEY, WILLIAM (1855—). An American scientist, born at Jersey City, N. J. He was educated at Princeton, where he graduated in 1877, and in 1880 was made professor of physical geography there. He also became fellow of the Geographical and Geological societies of London and Paris, and vice-president of the American Society of Naturalists. He led scientific parties to Hawaii, Mexico, and Cuba, and visited Greenland in the summer of 1894, and again in the summer of 1899.

LIBBY PRISON. A Confederate military prison during the Civil War, situated in Richmond, Va. It was a building three stories high in front and four in the rear, containing six rooms (excluding the cellar), each about 105 by 45 feet. Before the Civil War it was used by its owner, a Mr. Libby, as a tobacco warehouse. It was first used as a prison after the first battle of Bull Run, and continued to be thus used until the close of the war. At times as many as 1200 prisoners were confined there, most of them being Federal officers. The Confederate officers in immediate charge were Major Thomas P. Turner, commander, and Richard Turner, inspector. The prisoners suffered terribly from starvation, cold, and other causes, and many died or had their health permanently shattered while in confinement. Many attempts at escape were made, the most famous being that of February 9, 1864, when 109 prisoners made their exit through a tunnel 50 feet in length, which had been laboriously excavated by a small party of men under Col. Thomas E. Rose. Of the 109, 48 were recaptured, 2 were accidentally drowned, and 59 reached the Federal lines. In 1888-89 the building was taken apart, carried to Chicago, and there reconstructed. In September, 1889, many valuable relics having been stored in it, it was formally opened as the Libby Prison War Museum.

LIBEL (OF. *libel, libelle, libeau*, Fr. *libelle*, from Lat. *libellus*, diminutive of *liber*, book, inner bark of a tree). In admiralty practice, the first pleading of the complainant, which is filed in the office of the clerk of the court to commence the action. It is in the form of a petition addressed to the judge of the court by name, setting forth the nature and facts of the claim and containing a prayer that process issue in the proper manner. If the action is against an individual, a citation (q.v.) will issue directing him to appear and answer; if against a vessel, a writ issues to an officer of the court directing him to attach it, which is considered sufficient notice to the owners. The libel must be verified by the libellant, as the claimant is called, or his agent if he is without the jurisdiction.

The name was borrowed from the Roman law where a pleading known as the *libellus conventionis* was employed to commence an action. The word libel continued to designate the first pleading in an action under the civil law. It corresponds to a complaint or declaration in other actions. See Admiralty Law.

LIBEL. A term of the common law, descriptive of that species of defamation (q.v.) which is committed by writing or its equivalent. It is a criminal offense as well as a civil wrong. It consists of the publication of that which tends to bring another into hatred, contempt, or ridicule. Special damage to its victim need not be shown. Nor is the truth of a libelous publication always a defense. Many of our State constitutions declare that it is not a defense to a criminal prosecution, unless published with good motives and for justifiable ends. Fair reports of legislative debates, judicial proceedings, and similar transactions do not subject their publishers to action for libel. Various other immunities are accorded to news-gatherers and publishers by modern statutes. These should be examined in each jurisdiction.

A defamatory writing will not subject its author to an action, either civil or criminal, until it is published. For the purposes of a criminal prosecution, it is published as soon as any one knowingly exposes it to the sight of another, who is capable of understanding it. Accordingly, the writer of a defamatory article may be liable criminally, when he sends it in a sealed envelope to the one defamed. To render him liable in a civil action for damages, however, the writing must have been communicated to a third person; save in a few States, where the rule has been changed by statute. Such communication need not have been intentional. One who sends the writing to a third person by mistake may inflict as great an injury upon the victim of his defamation as though he had planned the injury. Nor can the publisher of a libel screen himself from civil responsibility by saying that it was a joke. In the language of a great judge, "No one can cast about firebrands and death, and then escape from being responsible by saying he was in sport."

A century and a half ago the weight of judicial authority favored the rule that the defamatory character of a publication was a question for the court and not for the jury. Mansfield's enforcement of this rule elicited the most violent criticism, and led to the enactment of a statute known as Fox's Libel Act (32 Geo. III., c. 60). "Although this statute only applies to criminal proceedings, it has been followed by analogy in civil actions for libel, and no plaintiff is entitled to succeed either in England or in the United States, unless the jury find that the publication is libelous. In a civil action, if the judge is of the opinion that the publication complained of is not defamatory, he may direct that the plaintiff be non-suited. Consult: Odgers, *A Digest of the Law of Libel and Slander* (3d ed., London, 1896); Newell, *The Law of Libel and Slander in Civil and Criminal Cases* (2d ed., Chicago, 1898); Townshend, *Treatise on the Wrongs Called Slander and Libel* (4th ed., New York, 1890); Pollock, *The Law of Torts* (6th ed., New York and London, 1901); Bigelow, *The Law of Torts* (7th ed., Boston, 1901). See also the articles Defamation; Slander; Tort.

LIBELT, lĕ′bĕlt, Karol (1808-75). A Polish politician and author, born in Posen. He studied in Berlin; entered the Polish Revolutionary army in 1830, and was imprisoned for nine months at Magdeburg. From 1840 to 1845 he edited at Posen two Polish newspapers; in 1845 was a member of the Revolutionary Central Committee, and in the next year was elected a member of the Provisional Government at Cracow. He was sentenced to twenty years' imprisonment for his part in this uprising, but regained his freedom after the revolution of March, 1848. He was a member of the Prague Slavic Congress, of the Frankfort Parliament of 1848, and in 1873 was elected to the Prussian Lower House. His writings include: *Filozofia i krytyka* (1845-50), Hegelian in tendency; *Estetyka* (1851); *Umnictevo* (1857), a system of ethics; *Dziela* (1875); *Zbior pism pomniejszych* (1849-51), political papers; *Dziewica Orléanska* (1847); and the sketches *Humor i pravada* (1852).

LIB'ERA. In Roman mythology, the wife of Liber, the wine god, identified with Persephone. Her festival, Liberalia, occurred on the 17th of March.

LIBERAL REPUBLICAN PARTY. In American history, the name given to a short-lived political party which participated in the Presidential campaign of 1872, composed largely of 'bolters' from the regular Republican organization. The party first appeared as a prominent political factor in Missouri in 1870, under the leadership of Carl Schurz and B. Gratz Brown, the latter of whom by a fusion of Liberal Republicans with a large element of the Democratic Party, was elected Governor. The faction here declared for "universal amnesty and universal enfranchisement," a reform in the tariff, an effective civil-service system, and a cessation of "unconstitutional laws to cure kuklux disorders, irreligion, or intemperance." As President Grant's first term drew near its close, disaffection in the Republican ranks throughout the country became increasingly pronounced, chiefly because of the President's policy of severity with regard to the Southern whites and his alleged misuse of his appointing power. In answer to a call issued by the triumphant fusionists of Missouri on January 24, 1872, a National Liberal Republican Convention met at Cincinnati on May 1st, and after much discussion, Horace Greeley was nominated for President and B. Gratz Brown for Vice-President, on a platform which, evading the tariff issue, declared for universal amnesty, the reëstablishment of civil governments throughout the South, and civil-service reform. On June 9th the Democratic convention assembled at Baltimore formally accepted the candidates and the platform of the Liberal Republicans, though a dissenting element subsequently met at Louisville and nominated Charles O'Conor for President and John Quincy Adams for Vice-President. The campaign was marked by much ill-feeling and considerable personal abuse, Greeley being especially attacked because of his affiliation with the Democrats, whom formerly, as a Republican, he had consistently opposed. In the election the fusion candidates were overwhelmingly defeated, Grant, the Republican candidate, being reëlected by an electoral vote of 286 to 63. The party, as an organization, did not survive the campaign. Among those besides Greeley and Brown who had been more or less prominently identified with the party were Charles Francis Adams, Lyman Trumbull, Carl Schurz, David Davis, Stanley Matthews, Horace White, George W. Julian, and David A. Wells.

LIBERAL UNIONISTS. A political party formed in Great Britain in 1886 through a division in the Liberal Party. It was headed by Lord Hartington, Joseph Chamberlain, and G. O. Trevelyan, and was composed of those Liberals who thought that the Empire should be preserved 'compact and complete.' The division then took place upon the introduction of the Home Rule Bill, by Mr. Gladstone. For a number of years after their secession the Liberal Unionists maintained their separate organization, and claimed to stand for distinctive principles. At present (1903) they have for all practical purposes become merged in the Conservative Party. See HOME RULE.

LIBERATOR, THE (Sp. *El Libertador*). A name applied to the South American patriot Bolivar.

LIBERATOR, THE. An anti-slavery journal founded in 1831 by William Lloyd Garrison. It was published until 1865.

LIBERATORE, lê-bä'rä-tō'rä, NICCOLÒ DI. The correct name of the Umbrian painter sometimes called Niccolò Alunno (q.v.).

LI'BER DIUR'NUS RO'MANO'RUM PONTIF'ICUM (Lat., Journal of the Roman Pontiffs). The title of a collection of formulas used in the Papal chancery from the fifth to the eleventh century in preparing certain documents, e.g. when sending the pallium, granting special privileges, Papal appointments, etc. Owing to altered conditions, it was no longer useful, and so was laid aside and after a time forgotten. When manuscript copies were discovered in Rome and elsewhere in the seventeenth century preparations were made for printing it, but the censorship refused permission; and though it was printed in Paris by the Jesuit Garnier (1680), the first official edition came out under the auspices of Benedict XIII. in 1724. The best edition is that of T. E. von Sickel (Vienna, 1889).

LIBE'RIA (Neo-Lat., from Lat. *liber*, free). A negro republic on the Grain Coast of West Africa, bounded on the north by French Guinea, on the east by the French Ivory Coast, on the southwest by the Atlantic, and on the west by Sierra Leone (Map: Africa, D 4). The coast-line is about 400 miles long, extending from the Mano to the Cavally. The area is estimated at 35,000 square miles. The boundaries were not fixed with England and France until 1885 and 1892, that part of the interior which drains into the Niger having finally, in the latter year, fallen to France. Only the coast strip, with an average width of 7 miles, is developed and administered. It is swampy and flat. The interior is elevated, and clothed with valuable forests of gum-trees, oil-palms, and pepper-shrubs. The hill land is healthful and naturally productive, and is the abode of elephants and buffalos. Among the numerous rivers —all comparatively small—are Saint Paul's (supposed to be 200 miles long), Saint John's, and Cestos. Some gold has been found, and the metal is thought to exist in large quantities. The climate has been called the hottest known on the globe, but is not considered so dangerous to white men as that of Sierra Leone. January is the warmest month. There are two rainy seasons, one in June and July, the other in October and November. The soil along the coast is very rich, and coffee is the leading crop, Liberian coffee being famed for excellence. The manufacturing interests are small. There are, however, several American, English, and German factories. The trade is also small and is mostly with Great Britain and Germany. It is not in a satisfactory condition. The coast is generally dangerous for vessels. The chief exports are coffee, rubber, cacao palm oil, and palm kernels. The rubber exports are controlled by a syndicate. The annual imports amount to less than $1,000,000. They are chiefly cotton fabrics and iron.

The constitution is framed after that of the United States. There are a President, Vice-President, a council of six ministers, and a Senate and a House of Representatives. The total membership of both Houses is 22. Voters must be of negro blood and own real estate. The natives generally do not avail themselves of the suffrage. No foreigner can own land without the consent of the Government. The coast territory is formed into the counties of Bassa, Cape Palmas, and Sinoë, with one superintendent each, and Montserrado, with four superintendents. The capital is Monrovia (named after President Monroe). There is a regular army of 1000 men. The militia number 500. The annual budget balances at about $200,000, the revenues being usually somewhat in excess of the expenditures. Customs duties furnish most of the receipts. The interest on the public external debt has been suspended most of the time since it was contracted in 1871. In 1899 an arrangement was made whereby the rate of interest was reduced, the principal amortized, and certain duties given over as security for the obligation. Nevertheless the debt is again accumulating through non-payment of interest. Liberia also has an internal debt on which the arrears of interest are large. English money is used, but American money figures usually in the keeping of accounts. There is a Liberian coinage and a rather large paper currency. The weights and measures are as a rule British. The official language is English.

The population is estimated to be about 2,000,000, some, however, putting it much lower. There are supposed to be about 60,000 American Liberians. Monrovia has about 5000 population. Other towns are Harper, Great Bassa, and Robertsport. The civilized inhabitants are orthodox Protestants, mostly Episcopalians. The bulk of the natives are Mohammedans and belong chiefly to the Vei race. There are secondary schools, and a college. This experiment of negro self-government in Liberia cannot be pronounced a success, the politics as well as the finances being in a demoralized condition.

History. The State of Liberia owes its origin to the efforts of the National Colonization Society of America (q.v.), organized in 1816, for the purpose of colonizing in Africa the free people of color in the United States. The first attempt to locate, which was made in Sherbro Island south of Sierra Leone (1820), failed in consequence of the unhealthfulness of the locality; but in December, 1821, a treaty was concluded by Lieutenant Stockton with certain native princes, by which a tract of land fit for the purpose was acquired about Cape Mesurado. It was some weeks before the hostility of the natives, who were wedded to the slave trade, could be overcome, but in April, 1822, active operations were begun on the mainland. A thirty-acre tract was allotted to each man with the means of cultivating it. The society's agents became discouraged at the difficulties that were met and returned to America with a few faint-hearted ones; but the others rallied about a determined negro, Elijah Johnson, and remained. The colony was enlarged by the purchase of new tracts. New settlements were afterwards formed at Cape Monte and in the newly acquired Bassa Land, in which, in 1834, a town was founded, and called Edina, in acknowledgment of pecuniary aid sent to the colony from Edinburgh. Many of the neighboring chiefs were received into the colony, and others were subdued. Trials of many kinds, deprivations, and dissensions, were the lot of the colony, managed by a society which did not fully know whether its aims were sentimental or practical. In 1847 Liberia was left to its own resources and declared an independent republic. The colony began to show more prosperity; numerous churches and schools were founded, a regular postal system was introduced, newspapers were established, and slavery in the neighboring States was abolished.

Bibliography. Wilson, *Western Africa* (London, 1856); Hutchison, *Impressions of Western Africa* (London, 1858); Valdez, *Six Years of a Traveler's Life in Western Africa* (London, 1861); Stockwell, *The Republic of Liberia: Its Geography, Climate, Soil, and Productions* (New York, 1868); Johnston, *Africa* (London, 1882); Johnson, *The Independence of Liberia* (New York, 1882); Wouvermans, *Liberia, histoire de la fondation d'un état nègre libre* (Brussels, 1885); Dutry, *Liberia, son histoire, sa constitution et ses resources* (Ghent, 1887); Bourziex, *La république de Liberia* (Paris, 1887); Büttikofer, *Reisebilder aus Liberia* (Leyden, 1890); McPherson, "History of Liberia," *Johns Hopkins University Studies*, series ix., No. 10 (Baltimore, 1891); Blyden, *A Chapter in the History of Liberia* (Freetown, 1892); Durham, *The Lone Star of Liberia* (London, 1893); Delafosse, *Un état nègre. La république de Liberia* (Paris, 1900).

LIBE'RIUS. Pope 352-66. He was born in Rome, but nothing is known of his history prior to his Pontificate, which fell in the stormiest period of the semi-Arian controversy. (See Arius.) The Emperor Constantius supported the semi-Arian party with all his authority; and the Council of Arles in 353, and that of Milan in 355, formally condemned Athanasius (q.v.), the great representative of the orthodox belief. Liberius refused to confirm this decree, and, even in opposition to the personal commands of Constantius, withheld his subscription. He was in consequence, in common with several others, deposed and banished to Berœa by the Emperor, who caused a Roman deacon, Felix, to be elected in his stead. He was restored to his see in 358, but the terms on which he was recalled are much disputed. He survived his return from exile eight years, and died in high repute for sanctity at Rome, September 24, 366. In the sixth or seventh century the relations between Liberius and Felix were completely reversed, and Liberius was made out to be an antipope, a heretic, and a tyrant. The only remains of Liberius are some letters preserved by Constant in the *Epistolæ Romanorum Pontificum* (Paris, 1821), reprinted in Migne, *Patrol. Lat.*, viii., German translation in *Bibliothek der Kirchenväter* (Kempten, 1876). In the Greek Church, Liberius is commemorated on August 27th; in the Latin, on September 23d. Consult Döllinger, *Pabstfabeln* (Munich, 1890).

LI'BER PON'TIFICA'LIS (Lat., pontifical book). A history of the bishops of Rome professing to begin with the Apostle Peter and extending to Nicholas I. (867), with an addition subsequently made of the times of Adrian II. and Stephen VI. (891). Anastasius, librarian of the Church under Nicolas I. and abbot of a convent in Rome, was formerly supposed by many to be the author of the book; but later investigations have shown almost certainly that it existed before his time. The oldest materials now known that were used in the compilation of it were furnished by a list of the popes down to Liberius, which was probably written before his death (366). The original MS. has been lost, but several copies of it, taken in the seventeenth century from other copies, are extant. Another list of the popes comes down to Felix IV. (530). Parts of it are almost literal copies from the former, but many additional particulars are given, drawn from various sources and having different degrees of historical value. Both lists were afterwards continued and ultimately formed the Liber Pontificalis, the oldest known copy of which belongs to the end of the seventh or the beginning of the eighth century. A first continuation of it extends to Gregory II., who became Pope in 714, and a second ends with Stephen III., 757. After this time several other continuations were made, the latest of which terminates, as has been mentioned, with Stephen VI., 891. Besides the sources already spoken of, materials for the history were furnished by traditions, written documents, buildings, inscriptions, and other monuments. Additions to the book have been made: (1) By three histories of the popes, the authors of which are not known, (a) from Lando (913) to Gregory VII. (1073), and belonging to the eleventh century; (b) extending down to the same date, and written during Gregory's life; (c) from Paschal II., in the early part of the twelfth century. (2) By a history written in the thirteenth century, extending from Gregory VII. to Honorius II. (1129). (3) By histories originating at the close of the twelfth century. The text is published in Migne, *Patrol. Lat.*, cxxvii., cxxviii. (under Anastasius), but much better by L. Duchesne (Paris, 1886-92, vol. i.), and by Mommsen in *Monumenta Germaniæ Historica* (Berlin, 1898, sqq.).

LIBER STU'DIO'RUM (Lat., book of studies). A set of prints from engraved plates prepared by J. M. W. Turner from his own designs, and published in parts between the years 1807-16. The intention was, probably, to issue one hundred plates, but only seventy-one were published, of which number one, the frontispiece, did not appear until several years after the commencement of the work and was then presented to the subscribers. More plates had been prepared, and prints from some of these are accessible. They are called 'the unpublished plates,' and are of very great value. The first scheme seems to have been to use aquatinta (q.v.) for the plates, with a skeleton or substratum of etched outline by Turner's own hand. The great majority of the plates are, however, in mezzotint, done by Charles Turner, T. Hodgetts, G. Clint, Thomas Lupton, and others; and the etching of each plate was in nearly every case by the designer himself, J. M. W. Turner. These etchings are generally of the most extraordinary merit and interest, and copies of them are greatly in demand. A very few of the plates are entirely in mezzotint, and by Turner himself, and these are of especial and peculiar importance to the student of landscape art. Single prints in the first state are quoted at several hundred dollars. A complete set in the finest condition may be worth $10,000. The biographies of Turner treat of *Liber Studiorum*, as it forms an important episode in the early prime of the artist's life. Good special commentaries are Rawlinson, *Turner's Liber Studiorum, a Description and Catalogue* (London, 1878); Pye, *Notes and Memoranda Respecting the Liber Studiorum of Turner* (London, 1879); Brooke, *Notes on the Liber Studiorum of J. M. W. Turner* (London, 1885). One of the illustrated catalogues of the Burlington Fine Arts Club is devoted to the work.

LIBERTAD, lĕ'bâr-täd'. A maritime department of Peru, bounded by the departments of Lambayeque, Cajamarca, and Amazonas on the north, Loreto on the east, Ancachs on the south, and the Pacific Ocean on the west (Map: Peru, B 5). Its area is estimated at over 10,000 square miles. A large part of the surface is occupied by the Andes. The strip along the coast is dry and low. The eastern part is crossed from south to north by the upper course of the Marañon (Amazon). Some of the valleys in that part of the department are very fertile. Mineral deposits are supposed to exist in the mountains, but mining is neglected. Population, according to official estimates, in 1895, 250,931. The capital is Trujillo (q.v.).

LIBERTIES, The. The name given to a district of Dublin, Ireland, formerly the home of citizens holding certain privileges. It contained many magnificent residences, but is now occupied by the poorer classes.

LIBERTINES (Lat. *libertinus*, relating to a freedman, from *libertus*, freedman, from *liber*, free), Synagogue of the. A synagogue at Jerusalem, mentioned in Acts vi. 9: "Then there arose certain of the synagogue, which is called the synagogue of the Libertines, and Cyrenians, and Alexandrians, and of them of Cilicia and of Asia, disputing with Stephen." The expression may mean Synagogue of Freedmen, referring to Jews who had been taken prisoner by Pompey, carried to Rome, and afterwards set free, and whose descendants may have returned to Jerusalem and formed, either alone or with other Jews, a synagogue there. A geographical term, however, would suit the context better in view of the four other geographical names. And in view of the African names Alexandria and Cyrene, it would seem that an African name should head the list. The reading *Libystines* has been suggested for *Libertines*, and is confirmed by an Armenian version which reads 'of Libyans.' If this plausible suggestion be accepted, the passage refers probably to two synagogues, one made up of African Jews from Libya, Cyrene, and Alexandria, the other made up of Jews from Cilicia and Asia. Consult Blass, *Philology of the Gospels* (New York, 1898).

LIBERTINES, The, or Spiritualists. (1) An odious and pernicious sect that sprang up in the sixteenth century in the Reformed Church of France. They arose in Flanders about 1525, perhaps as a recrudescence of the ancient Beghards (see Beguines) and Brothers and Sisters of the Free Spirit (q.v.). They are said to have made 4000 proselytes in France alone, and not only among the lower classes, but also among the higher and learned. They obtained the favor and protection of Margaret, Queen of Navarre, sister to Francis I., and found patrons in several of the Reformed churches. They called themselves Libertines and Spiritual Brethren and Sisters. Their system was pantheistic and antinomian. From being a mere dogma, it degenerated into open and avowed sensualism. Calvin sternly denounced their principles, and it was because of his efforts that this sect left France, took refuge in the Netherlands, and at last entirely disappeared. (2) A party in Geneva, opponents of Calvin, were also called Libertines, but they had only the name in common with the above. These Libertines were in general the opponents of the policy and theology Calvin strenuously enforced and defended; but they were formidable enough to raise an insurrection in Geneva on May 15, 1555. Their leaders being exiled or imprisoned, the power of the party was broken. (3) This name in England was given to the early Anabaptists about the middle of the sixteenth century. See ANABAPTISTS.

LIB'ERTY. A city and the county-seat of Clay County, Mo., 14 miles northeast of Kansas City; on the Chicago, Milwaukee and Saint Paul and the Hannibal and Saint Joseph railroads (Map: Missouri, B 2). It is the seat of the Liberty Ladies' College (non-sectarian), opened in 1890, and of the William Jewell College (Baptist), opened in 1849. The city has considerable trade in the farm produce and live stock of the adjacent region, and some manufactures, principally of flour. Population, in 1890, 2558; in 1900, 2407.

LIBERTY, CLAIM OF. See CLAIM.

LIBERTY, RELIGIOUS. The inherent right of the individual to form his religious opinions according to the dictates of his own conscience, and to give outward expression to them in the form of public worship independently of all restraint or coercion upon the part of the State. It includes more than mere freedom of conscience, which in reality is beyond the control of the civil power. It includes also more than mere toleration, which simply concedes for the time the right of the individual to worship as he pleases—a concession which implies the superiority of an established church and which may be withdrawn at the will of the sovereign granting it. Religious liberty implies the equality of all in the matter of worship, while the principle upon which toleration is granted denies this idea. Religious liberty is frequently characterized as one of the absolute, inalienable, or natural rights of the individual, while toleration is a concession emanating from the benevolence of the sovereign.

Among the nations of antiquity the idea of religious liberty was almost totally lacking. In Egypt, Assyria, Babylon, Persia, and Syria the individual was subject to the will of the King in religious as in civil matters. In the Roman Empire worship of the State religion was obligatory upon every subject. The Christian religion was tolerated merely by many of the emperors during the early centuries of the Christian Era. There were spasmodic persecutions by Nero, Domitian, Hadrian, and others, but it was not until the reign of Diocletian that a determined effort was made to exterminate the Christian religion. By his order all Christian assemblies were forbidden; all churches were to be destroyed; all Christian books to be burned; and all Christians who refused to adopt the State religion were to suffer death. Early in the fourth century a formal act of toleration was granted to the Christians by the Emperor Galerius, but it was expressly enacted that they were to respect the religion of the State. This was soon followed by the conversion of the Emperor Constantine, and his promulgation, in 313, of the celebrated Edict of Milan, which granted the fullest toleration of religious worship to all persons. This was shortly followed by an edict prohibiting heathen worship and establishing Christianity as the State religion of the Empire.

Throughout the Middle Ages the question of religious liberty scarcely arose. The teachings of the Roman Catholic Church were unquestioned and its authority universally recognized in most of the countries of Europe. But when the Albigenses in Southern France refused to accept the Catholic doctrines, they were condemned as heretics and the sect exterminated. To prevent recurrences of a similar kind, decrees were issued by the sovereigns of Western Europe against all who refused to accept the Christian faith as understood by the Catholic hierarchy. Where the domination of the Papal authority was displaced, as in England under Henry VIII., it was superseded by the royal authority, not less intolerant. Thus we find Henry VIII. persecuting those who, on the one hand, acknowledged spiritual allegiance to the Pope, and those, on the other hand, who, while acknowledging Henry's supremacy as head of the English Church, yet denied certain of the Roman dogmas. Nor did the Reformation introduce the principle of religious liberty into Europe. For, while the Protestant denied the authority and much of the doctrines of Rome, he nevertheless insisted upon unity of faith as essential to the integrity of the State. According to the maxim *Cujus regio, cujus religio*, it was the right and duty of the prince to choose a religion for his subjects and require them to worship it. It followed that it was his duty to root out heresy and punish non-conformists. Thus Servetus was burnt at the stake in Geneva, which was under Calvin's control, for denying the doctrine of the Trinity; the Covenanters were hunted down and slain because they could neither accept Episcopacy nor the National Kirk; and the Pilgrims emigrated to the wilds of America because they would not conform to the Anglican faith. The theory which then obtained was that, religion and morality being the basis of the State, it became the first duty of a wise prince to establish a national religion, and it was believed that the existence of two religions in the State would endanger its security.

Strangely enough, those who fled to America to escape religious persecution brought with them the Old World ideas of religious intolerance. Everywhere in New England except in Rhode Island dissent from the 'established order' of worship was looked upon as sedition against the State and sin against God. Jesuits, Baptists, and Romish priests were punished by imprisonment or banishment, while several Quakers were publicly hanged on Boston Common. Practically the same policy was followed in the colonies planted in the South. The Puritan insisted upon conformity because he wished to make the State a religious unit; the Cavalier required it because the Church was a part of the civil polity. In the Colony of Rhode Island State and Church were absolutely divorced from the first, and the individual left entirely to the teachings of his own conscience. In the Catholic Colony of Maryland religious toleration existed for a while, except as to Jews, Mohammedans, and other non-Christians; but eventually the Church of England was established by law. In New York and New Jersey strenuous efforts were made by the English authorities to impose the Church of England in place of the Dutch Reformed Church, but without success. In Georgia liberty of worship existed until near the Revolution, when the Church of England was established as the State religion. In Pennsylvania and Delaware, as in Rhode Island, no State Church ever existed.

The framers of the Federal Constitution inserted a provision in that instrument declaring that no religious test should ever be required as a qualification to any office or public trust under the United States. Doubtless they had in mind the celebrated Test and Corporation acts of the Stuarts, enforced in all the colonies except Rhode Island, and in some of them down to the Revolution. Even in tolerant Pennsylvania all public officers had to declare and subscribe to their disbelief in transubstantiation, the adoration of the Virgin Mary, and the sacrament of the Romish mass as superstitious and idolatrous. There was considerable opposition to the adoption of the Federal Constitution on account of its lack of a provision excluding non-Christian sects from the right to hold office, and also of a provision prohibiting Congress from creating a State religion; and the first amendment to the Constitution was one prohibiting Congress from making any laws respecting an establishment of religion or prohibiting the free exercise thereof. The States, however, were left free to establish a Church and restrict religious worship as they saw fit. As a matter of fact, all of the States which maintained established churches during their colonial existence have disestablished them and inserted in their constitutions provisions granting religious liberty. A complete divorce of Church and State was not accomplished in some of the commonwealths until after the adoption of the Federal Constitution. It came finally in Virginia through a decision of the Court of Appeals in 1840; in Delaware and Connecticut through the adoption of new constitutions in 1818 and 1831; in Massachusetts through an act of the Legislature in 1833; in Pennsylvania and South Carolina through the adoption of new constitutions in 1790; in Vermont and New Hampshire through acts of the Legislature passed in 1807 and 1819. At the present time twenty-six of the State constitutions declare it to be the privilege of "every man to worship God according to the dictates of his own conscience." Eleven declare that the "free enjoyment of religious sentiment and forms of worship shall ever be held sacred." Five make it the duty of the Legislature to pass laws for the protection of religious freedom. Nineteen declare that "no human authority ought to control or interfere with the rights of conscience," while nine ordain that "no person may be molested in person or estate on account of religion." Most of the State constitutions forbid compulsory attendance or support of any Church; many of them forbid the appropriation of money for the support of sectarian institutions, although New Hampshire, Massachusetts, and Missouri allow the parishes to provide for the support of religious teachers; while nearly all in one form or another forbid religious tests for office. Curiously enough, however, eight States, some of which forbid religious tests, disqualify from public office all who deny the existence of a Supreme Being or a future state of rewards and punishments.

While almost complete liberty of worship now exists in the United States, it is recognized that religious liberty, like the liberty of the press and speech, may be abused to the injury of others and the detriment of the public morals. Thus the constitutions of many of the States provide for a guarantee against abuse by declaring that liberty of conscience shall not be construed to excuse acts of licentiousness or justify practices inconsistent with the peace and safety of the State, and the Supreme Court has held that liberty of worship as understood in the United States extends only to relations between the individual and an extra-mundane being, and not to relations among individuals themselves. On this ground the court held that a law of Congress prohibiting the practice of polygamy was not an infringement of religious worship.

The influence of the American idea of religious liberty has been very powerful over Europe and elsewhere. In France different religious denominations are treated equally, all receiving State aid. In Germany liberty of worship is allowed subject to certain restrictions upon the right of assembly. In England the Anglican Church is still the established faith, but religious tests for office, except in the case of the Crown, have been abolished.

LIBERTY (OF. *liberte*, Lat. *libertas*, from *liber*, free), STATUE OF. A colossal bronze statue executed by **Frédéric Bartholdi**, a French sculptor, and presented to the people of the United States by the people of France. It stands on Bedloe's Island, in New York Harbor. The gift was designed to commemorate the hundredth anniversary of American independence. It was, however, not placed in position until 1885, and it was dedicated October 23, 1886. The statue represents a female figure holding a torch aloft. It is the loftiest statue in the world. The figure measures 111 feet in height, and to the extremity of the torch 151.41 feet. The torch is 305 feet 11 inches above mean tide. Forty persons can stand within the head, to which there is access by a staircase inside of the statue; a branch staircase leads into the extended arm. The torch is equipped with an electric light. The foundation was contributed by subscription among the American people.

LIBERTY BELL. The bell which first rang to celebrate the adoption of the Declaration of Independence, July 4, 1776. It was brought to Philadelphia from England in 1752, and was recast in April and again in June, 1753, when the words "Proclaim liberty throughout all the land, unto all the inhabitants thereof" (Lev. xxv. 10), were inscribed on it. For many years it was rung annually on the Fourth of July, but on July 8, 1835, while being tolled in memory of Chief Justice Marshall, it was broken. It now hangs in the hallway of the old State House in Philadelphia.

LIBERTY BOYS. A familiar name for the Sons of Liberty of the American Revolution.

LIBERTY CAP. A conical, close-fitting cap with the top drooping forward, sometimes known as the Phrygian cap from the fact that such a head-dress was commonly worn by the ancient Phrygians. A cap of this sort was a mark of freedom among the Greeks, and the placing of it upon the head of a slave was one of the ceremonies attending his manumission. The murderers of Cæsar carried through the streets a liberty cap on the end of a pole; and coins were stamped with a cap between two daggers at the command of Brutus and Cassius. The symbol was also adopted in the Netherlands at the time when they threw off the yoke of Spain: but it is most famous for its connection with the French Revolution. Louis XVI. on June 20, 1792, was forced to put it on his head as a token of his sympathy with the popular demands. In August of the same year it was officially adopted as the badge of a 'patriot.' The cap has also appeared on the head of the Goddess of Liberty or on a pole by her side on some of the coins of the United States.

LIBERTY, EQUALITY, AND FRATERNITY. The watchword of the French Revolution, denoting the salient principles of the teachings of the social philosophers of the eighteenth century. The phrase may be conceived as the political confession of faith of the first French Republic, and lay at the basis of its institutions in much the same sense as the similar phrase in the Declaration of Independence underlies the recognition of the sovereignty of the people in the Constitution of the United States. See NATURAL LAW.

LIBERTY HALL. The name given by Squire Hardcastle to his house in Goldsmith's *She Stoops to Conquer,* and a proverbial term for a house where guests are free to follow their own inclinations.

LIBERTY OF THE INDIVIDUAL. Individual liberty has reference to a sphere of action in which the individual is referred to his own will so far as the limitations of Government are concerned. Viewed from one side it consists of *immunities* or exemptions from the operation of governmental power; looked at from the other side it consists of positive *rights* which it is the duty of the Government to enforce and protect. While the content of individual liberty varies among races, the Western nations have reached a substantial consensus in regard to its essentials. It now generally includes freedom of person and of property, freedom of conscience and its expression, freedom of opinion and its expression, subject to the restrictions everywhere imposed by the law of libel and slander, and equality before the law. Besides this sphere, which is now practically universal, a still wider realm of liberty has been created in many States, and is embodied in their constitutions. In the Constitution of the United States, it includes the right of assembly for the purpose of petitioning the Government for redress of grievances, the right of bearing arms, immunity from the quartering of soldiers in one's house, immunity from unreasonable searches, immunity from prosecution by the Government except in accord with usages and procedure which have been in common use from time immemorial. In States having the federal system of government it is necessary to provide a double sphere of liberty for the individual; one against the operation of the general Government, and one against the operation of the local governments. In the United States the great source of individual liberty is the Constitution. In fact, the American Constitution is quite as much an instrument of liberty as of government. The national Constitution and all of the State constitutions, with one or two exceptions, have elaborate bills of rights in which a sphere of liberty is marked out and upon which the Government is forbidden to encroach or to permit any individual to encroach. The same feature appears in modified form in the German Imperial, the Swiss, and the Prussian constitutions, but not in the Constitution of the French Republic or those of the remaining European States. The chief guarantee of individual liberty in the United States is the power of final interpretation of the Constitution by the Supreme Court, and the power of Congress to impeach and remove all civil officers of the United States.

LIBERTY OF THE PRESS. See LIBEL; NEWSPAPER.

LIBERTY PARTY. A political party which existed in the Northern States of the American Union from 1839 to 1848, and was the first regular organization that attempted to oppose slavery by political means. The abolitionist followers of William Lloyd Garrison (q.v.) had adopted the doctrine of non-participation and non-resistance. With this policy the practical anti-slavery men were not satisfied, and after seeing the futility of their attempt to make their influence felt by interrogating candidates for office as to their position on the slavery question, they concluded that a party organization was the only rational means of accomplishing anything of value. This view, particularly strong in western New York, Ohio, and Michigan, found perhaps its ablest advocate in Myron Holley, who at a meeting of the American Anti-Slavery Society in vain introduced and advocated a resolution declaring that "it was time to form a new political party," and proposed the nomination of candidates for the Presidency and Vice-Presidency. Within a month (November 13, 1839), at a local convention at Warsaw, N. Y., Holley was instrumental in securing the nomination of James G. Birney (q.v.) and Francis J. Lemoyne as candidates for President and Vice-President respectively. A 'national' convention composed mostly of New York delegates, and held at Albany, April 1, 1840, confirmed Birney's nomination, nominated Thomas Earle for Vice-President, and adopted the name of Liberal Party. But the enthusiasm of the 'Tippecanoe and Tyler too' campaign retained in the Whig ranks most of those whose anti-slavery views might otherwise have led them to support the new party's ticket; and despite the fact that an active campaign was carried on, the ticket polled a total of only 7059 votes, 2798 of which were cast in New York. Disappointing as was the result, the Liberty Party leaders did not lose heart, but at once set about preparing for the campaign of 1844. On May 12, 1841, the first really national convention of the party was held in New York, in which all the New England States, New York, Pennsylvania, New Jersey, Ohio, and Indiana were represented. Birney and Thomas Morris were nominated as the party's candidates for 1844, and a complete national organization was planned. The party at this time was made up of the more moderate abolitionists, who held that the Constitution gave the general Government no power to abolish slavery in the States, and proposed only its abolition in the District of Columbia and the Territories, through Federal action, leaving the several States to act as they could be persuaded. The next convention was held in Buffalo on August 3, 1844. A slight movement within the party favorable to Clay, who had pronounced against Texan annexation on the ground that it would involve the United

States in a war with Mexico, was checked by the publication of a letter written by Clay in which he had said that he would 'be glad to see' Texas annexed some day. This turned the scale, and the nominations of Birney and Morris were confirmed. At the ensuing election the Liberty Party polled 62,300 votes, 15,812 of them in New York, almost all of them drawn from the Whig Party. The loss of these votes assured the election of Polk and Clay's defeat. The first actual effects of the Liberty Party's action, therefore, were the election of Polk, the annexation of Texas, and the addition of a considerable area of new slave territory to the Union. Their last great effort made in the elections of 1846 was attended with no success. Their last National Convention, held in Buffalo, October 20, 1847, nominated John P. Hale and Leicester King for President and Vice-President, but the movement toward amalgamation with the new Free-Soil Party (q.v.) had already begun. The nominees withdrew after Van Buren's nomination, and except for the continued activity of a small number who had adopted the view that slavery could be abolished under the Constitution by a simple act of Congress, the Liberty Party ceased to exist. The best account of the Liberty Party is contained in T. C. Smith's *Liberty and Free Soil Parties in the Northwest* (New York, 1897), "Harvard Historical Studies," vol. vi. Consult, also, William Birney, *James G. Birney and His Times* (New York, 1890); Morris, *Life of Thomas Morris* (Cincinnati, 1856); Hart, *Salmon P. Chase* (Boston, 1899), in the "American Statesmen Series;" and Hammond, *History of Political Parties in the State of New York* (Cooperstown, 1846).

LIBERTY TREE. (1) An elm in Boston, upon which the citizens hung the effigies of the British stamp distributor and other unpopular persons during the excitement connected with the Stamp Act. The tree stood on Washington Street, and is recalled by an appropriate device on the building which occupies its site. (2) A Revolutionary War ballad by Thomas Paine (1775), published in the *Pennsylvania Magazine*.

LIBER VERITATIS (Lat., Book of Truth). A series of original drawings made by Claude Lorrain for the purpose of protection against the imitation of his paintings by others. Only six copies of the work exist.

LIBIDIBI, lē'bē-dē'bē. A tropical tree whose pods are used in tanning. See Divi-divi.

LIB'ITI'NA. An old Italian goddess of voluptuous pleasure, of gardens and vineyards, and of the dead, hence identified both with Venus and with Proserpina. From her temple all the necessary apparatus for funerals had to be bought, and a piece of money was deposited there for every person dying in Rome. Undertakers were called *libitinarii*, and the gate of the amphitheatre through which the dead were removed bore the name of Porta Libitinensis.

LIBMANÁN, lēb'mä-nän'. A town of Luzon, Philippines, in the Province of Ambos Camarines. It lies about 11 miles northwest of Nueva Cáceres and 4½ miles south of the Bay of San Miguel. It has a post-office and a telegraph station. Population, in 1898, 14,512.

LI'BOCE'DRUS (Neo-Lat., from Gk. λίβος, *libos*, tears + κέδρος, *kedros*, cedar). A genus of evergreen trees, belonging to the Coniferæ, resembling the arbor vitæ, but differing in the structure of the cones, the scales not overlapping as in that tree. There are two species in New Zealand, *Libocedrus Bidwellii* and *Libocedrus Doniana;* two in the mountains of Chile, *Libocedrus Chilensis* and *Libocedrus tetragona;* one in the Pacific Sierras of the United States, growing usually at an elevation above 4000 feet; one in China, *Libocedrus macrolepis;* and one in New Caledonia, *Libocedrus austro-calidonicus.* The Western United States species was named by Torrey *Libocedrus decurrens,* from the fact that the bases of the small scale-like leaves are decurrent upon the stem. The tree attains a height of from 120 to 140 feet, and a trunk from 6 to 8 feet in diameter, without branches for 80 to 100 feet. It is found from Oregon to Lower California. Its beautiful, glossy green foliage and its graceful form when young make it one of the finest of ornamental evergreens. It has been confounded with the *Thuya gigantea,* but its decurrent leaves make an easy distinction. In California it is called white cedar. Its wood, of a yellowish color, surpasses redwood in durability, and is valuable for various purposes.

LIBOURNE, lē'bo͞orn'. The capital of an arrondissement in the Department of Gironde, France, at the confluence of the Isle with the Dordogne, 17 miles east-northeast of Bordeaux (Map: France, F 7). Its ancient features include the fourteenth-century Tour de l'Horloge, the fifteenth-century Church of Saint Jean Baptiste with a steeple over 230 feet high, and a sixteenth-century Hôtel de Ville. Its modern institutions comprise a communal college, a school of hydrography, a museum, a library, a botanical garden, and a theatre. The surrounding district abounds in vineyards. The chief manufactures of Libourne are liquors, sugar, woolen goods, etc.; it carries on a considerable trade in local manufactures and agricultural products. The harbor is accessible for small vessels. Population, in 1891, 17,867; in 1901, 19,175.

LI'BRA (Lat., balance). The seventh sign in the zodiac. At the first point of Libra, the ecliptic passes across the equator to the Southern Hemisphere, this point being thus the *autumnal equinox.*

LIBRARIES. A term applied indifferently to buildings designed to contain books, and to the books deposited in these buildings. In the present article it is used chiefly in the latter sense.

History. Though there were libraries in ancient times in Egypt, no remains of these collections have been found. From very early days Babylonia was the seat of a learned and literary people, and almost every important temple contained its library of clay tablets with cuneiform inscriptions, carefully shelved in regular order. Such a library was recently (1901) found at Nippur, in the great temple of Bel, which was destroyed in the Elamite invasion (c.1782 B.C.). It was from the treasures of such libraries that King Assurbanipal of Assyria, in the seventh century B.C., caused copies to be made for the great library which he gathered in his palace at Nineveh. The tablets here found by Layard and his successors contain history, science, religion, grammars, and dictionaries in the original languages of Babylonia, and in translation. Among the Greeks private libraries doubtless existed during the fifth and fourth centuries B.C., and there may be some truth in the stories of the collection of books by the earlier tyrants, such as Pisistratus and Polycrates; but these were of moderate size, even the library of Aristotle probably containing only a few hundred rolls. It is with the founding of the Alexandrian Library (q.v.) by the first of the Ptolemies that the history of the great classical libraries begins. The library of Pergamum, a formidable rival to that of Alexandria, was founded probably by Attalus I., and was largely increased by the fostering care of his successors. It was ultimately removed to Alexandria, being sent by Antony as a gift to Cleopatra. At the time of this transference it contained, according to Plutarch, 200,000 volumes. At Rome interest in literature developed slowly, but we are told that the library of the kings of Macedon was brought to Rome by Æmilius Paulus (B.C. 167). In the first century B.C. there were some notable private collections, as that of the grammarian Tyrannion, estimated at 30,000 rolls, and the carefully selected and valuable collection of Atticus, the friend of Cicero. Cæsar is said to have planned a public library; and Pliny states that C. Asinius Pollio (B.C. 39) erected from the spoils of his Parthian victories the first public library in Rome, in the temple of Libertas, near the Forum; but according to Plutarch this honor should be given to Lucullus. Another library was established by Augustus on the Palatine, in connection with his new temple of Apollo. This was divided into Greek and Latin sections. Another was placed by the same Emperor in the Portico of Octavia. Tiberius and later emperors continued this work. Especially famous was the Ulpian library, established by Trajan, which soon surpassed all others in Rome, and was later removed from the Forum of Trajan to the Baths of Diocletian. Nearly 1700 MSS. and fragments of MSS. have been found in a library room at Herculaneum, about 400 of which have been more or less unrolled and deciphered.

In the ancient libraries the books, usually rolls of papyrus, were kept in closets, in somewhat small rooms, which, however, seem to have been arranged for the use of the books. Catalogues were prepared, and the tablets of Alexandria were valuable sources for literary history. The librarian was commonly a distinguished scholar, and at all times seems to have ranked as an important public officer. The first librarian of whom we have any record was a Babylonian named Amil-anu, who lived about 1600 B.C., one of whose signet cylinders is in the British Museum. Nehemiah is said to have founded a library, and references in the Books of Samuel and Kings to other books imply the existence of some collection in which these works might be found.

Eusebius mentions an early Christian library founded by the martyr Alexander, Bishop of Jerusalem, who died A.D. 250. Saint Pamphilus, another Christian martyr (A.D. 309), founded at Cæsarea a public library of about 30,000 volumes, chiefly theological, which is said to have been destroyed by the Arabs in the seventh century. Saint Jerome had a large library, and made frequent use of that at Cæsarea; in one of his letters he refers to the use of church libraries as though each church had one. Saint Augustine, on his deathbed, A.D. 430, requested that the library of the church at Hippo and all the MSS. should be carefully preserved. In the primitive monasteries of Tabenna, founded by Pachomius, in the depths of the Thebaid, there was a library in every house.

Julian the Apostate (A.D. 363) founded libraries of a different character, upon which he inscribed the words: "Some love horses, some birds, others wild beasts, but from boyhood I have been possessed with the desire of acquiring and owning books." Constantine the Great founded (A.D. 336) a library at Constantinople, which at his death is said to have contained 6000 volumes; it grew under Julian and Theodosius the Younger to 120,000 volumes. In it was deposited the only authentic copy of the proceedings of the Council of Nice, and among its curiosities were a MS. of Homer, one hundred and twenty feet in length, written in letters of gold on serpents' skin, and a copy of the Four Gospels bound in plates of gold weighing fifteen pounds and enriched with precious stones. This library was destroyed by fire under Zeno. A later collection, extending to 33,000 volumes, is said to have been destroyed by Leo III., 'the Iconoclast,' A.D. 730. The triple fire at the capture of Constantinople by the Crusaders, in 1203, eclipsed all previous ones in destructiveness. Two hundred and fifty years later came the final disaster of the Ottoman conquest. Despite all these losses, possibly through some of them, the great libraries of Europe owe to Constantinople some of their choicest treasures.

Through the Middle Ages books and learning were preserved by the monasteries, especially those of the Benedictines, beginning at Monte-Cassino, A.D. 530. Each Benedictine house instituted first a library, then the *scriptorium* or writing-room, where MSS. were copied for sale or exchange, and lastly the school, open to all who desired instruction. Many famous libraries of Europe had their nuclei in these Benedictine collections. Notable among these are the libraries of Monte-Cassino, Fleury on the Loire (c.650), Corbie (662), Hersfeld, Ratisbon, Corvei (q.v.), Reichenau (724), Fulda (744), Saint Gall (820), and Clugny (910).

England is indebted to the Benedictines for her earliest library, that of Christ Church, Canterbury (596), and for Saint Peter's of York, Saint Cuthbert's at Durham, and those at Peterborough, Wearmouth (647), Bury Saint Edmunds, Reading, and Saint Albans. The Franciscans had a considerable library at Oxford, to which Adam de Murisco left his books, 1253. The Bodleian was opened in 1602. The library of the University of Cambridge dates from 1475. Charlemagne established libraries in his cloister-schools at Aix-la-Chapelle and Tours, to which Alcuin brought the training he had secured at Saint Mary's, in York, England.

With the fourteenth century came the establishment in Germany of the university libraries, at Prague (1348), Heidelberg (1386), Leipzig (1409); and the first public town libraries, the outcome of humanism, at Ratisbon (1430), Vienna (1440, opened to the public in 1575), and Frankfort (1484). The suppression of the monasteries after the Reformation gave an impulse to the foundation of the royal and town libraries. Many important ones were established in the eighteenth and nineteenth centuries: Göttingen (1737), Bonn (1818), Strassburg, dating back to 1566, rising phœnix-like from the ashes of the siege of 1870. All the universities of Germany have notable libraries.

Spain with its University of Palencia (1212) and of Salamanca, a few years later, takes a very early place in library history. The National Library at Madrid owns the Columbus Letter in Spanish among its rarities.

The famed *Corvina*, established by Matthias Corvinus (c. 1460), had a rapid growth, but its treasures were dispersed by the Turks in 1527, and scattered specimens are to be found in more than thirty of the libraries of Europe. The Royal Library at Copenhagen, dating from 1479, is the largest of Scandinavian libraries, is specially strong in Icelandic literature, and has a fine collection of Persian MSS.

The first public library in Italy was founded at Florence, in 1437, on a bequest by Niccoli, the Florentine Socrates, of his own collection of 800 MSS. Cosmo de' Medici erected a building for it in 1441, and later, under his grandson, Lorenzo de' Medici, it acquired the name of Laurentian Library. With the expulsion of the Medici at the close of the fifteenth century the collection passed into the possesion of a monastery. Later Leo X. bought it, and in 1521 Cardinal Giulio de' Medici restored it to the city and housed it in a building erected by Michelangelo. Nicholas V. founded the Vatican Library in 1447 and left it at his death enriched with 9000 MSS. In 1588 its present building was erected by Sixtus V. In 1658 the famous Urbino Library was acquired for it. Queen Christina of Sweden enriched it with a splendid collection of MSS. and books. In 1746 the Ottobuoni collection of 3862 German and Latin MSS. was added. Italy is exceedingly rich in libraries of historical interest; her university libraries contain many MSS. and incunabula. Among the famous collections may be named the Ambrosian Library (q.v.) at Milan, founded in 1602; the Casanata, at Rome; the National Central, at Florence, formed by the union of the well-known Magliabechiana and Palatina; and the National of Saint Mark, at Venice. The archives of Venice, complete for more than ten centuries, and numbering fifteen million documents, are housed under a single roof.

France, in the Bibliothèque Nationale, at Paris, has the largest library in the world. Charles V. in 1368 had a tower in the old Louvre fitted up as a library, where he gathered 910 volumes. These were scattered during the English wars, and many fell into the hands of the Duke of Bedford and were carried to London. Louis XI. made an effort to revive the library. Henry IV. gave it a home in the Collège de Clermont and appointed De Thou librarian. It narrowly escaped destruction at the time of the Revolution, when two of its librarians were guillotined. In 1666 it was removed to its present building, which has been frequently enlarged to accommodate the rapidly growing collection. The minor libraries of Paris include the Arsenal, founded in 1755; the Mazarin (1643); and the Library of Sainte Geneviève (1624). The library of the Abbey of Saint Victor, the first opened to the public in France, went largely, at the dissolution of the monasteries, to the Bibliothèque Nationale. Large libraries owing their origin to monastic collections and to the liberality of private persons are to be found in all the provincial cities of France. Most noteworthy are those of Lyons (1630), Aix (1705), Rouen (1809), and Bordeaux (1768).

Many notable libraries in England and on the Continent collected by private individuals during the past five centuries still bear their names, or have been merged in university or public libraries or dispersed at auction sales. Subscription and circulating libraries began to be established about the middle of the eighteenth century, and have been widely successful. Some town libraries were established at dates much earlier.

The earliest library in America was that presented to the Henrico College, established by the colonists at Jamestown, Va., in 1621, destroyed with the colony the next year.

Harvard University Library was founded in 1638. In 1700 came the Public Library in New York, changed in 1754 into the present Society Library. In 1700, also, South Carolina passed the Provincial Library Law to encourage parochial libraries. Yale College Library was founded in 1701. In 1731 Benjamin Franklin founded the Library Company of Philadelphia, which he called the 'mother of all North American subscription libraries.' In 1800 the national library, called in its first general catalogue the Library of the United States, and later misnamed the Library of Congress, was established.

The first recognition of the principle of taxation for support of public libraries was the New York District Library Law of 1835. This was not for school but for public libraries, unwisely placed in charge of school officers as a mere convenience of administration. The general plan was copied in twenty-three other States; and without exception has proved that while schools and libraries should work in the greatest harmony, the best results demand that their administration be separated. Exceptions have been only enough to prove the rule. These district libraries did a beneficent work, but under their own trustees, with proper supervision and well-organized administration, the same money might have done vastly more. But the law made the needed beginning in recognizing the popular educational character and possibilities of libraries. In 1849 New Hampshire passed a law allowing towns to tax themselves for libraries. In 1850 Great Britain passed the famous Ewart Free Libraries Act. In 1852 the Boston Public Library was founded, and for a generation led the world in showing what might be done by a municipal library. In 1853 fifty-three librarians held the first library convention of the world in New York City, and received their first idea of the card catalogue.

Types of Libraries. Because of their number and importance, public libraries are always meant unless some other type is specified. In private and family libraries the shelf-list is the most important single record, as it combines in cheapest form both invoice book and inventory, and may easily have added to it the essential accession book facts. With better understanding of their value, many private libraries now have card indexes and accession books as well as shelf-lists.

Proprietary and club libraries are only larger family libraries, as they are open only to those elected to membership.

Subscription or circulating libraries are carried on as a business and are usually open to all who pay the fees. Their records and methods are the simplest and cheapest, except for institutions like Mudie's and Smith's in England, and the Booklovers with its Tabard Inn and other branches in this country.

National and State libraries have a distinct function in preserving for posterity everything printed which they can obtain. They are the central storehouses on which all local libraries in their field may draw when necessary. This demands large provision for storage and facilities for sending books quickly and safely to students and libraries. They should have books, pamphlets, manuscripts, and other material which because of rarity or little demand are seldom found in local collections. The smaller libraries have learned that the first cost of a book is seldom its chief expense. It must be catalogued, classified, shelved, cleaned, and inventoried yearly even if never used. Libraries limited in funds cannot afford to accept as gifts books seldom used. The average library is becoming one in a series of sieves. The traditional conception of a library required it to keep all it could get. The immense growth in volume of books issued has enforced new ideas. A scholar outgrows certain books which he has kept on his table, and relegates them to the shelves of his private library. Later he sifts out books seldom wanted and sends them to the public library, where they will serve the whole locality instead of one person. Club and subscription libraries make room by disposing freely of books no longer needed. Recently thoughtful observers realize that even public libraries, except a few great central storehouses, must in turn take their place in the series of sieves and abandon the plan of keeping everything, selecting up to their capacity what will be most useful and sending the rest to State or national centres, to be destroyed if found to be duplicates too common to be worth keeping.

Special Libraries. Every department of human endeavor is recognizing the library as its laboratory, with the result that special libraries are formed for special work. This gives libraries not only for law, medicine, theology, education, art, history, but for every distinct department. These libraries on special subjects are sometimes independent, but experience proves that they are more wisely treated as branches of the central collection and kept under supervision of its director.

The value of the best reading in giving to any class of people information that will help them to do their work better, or inspiration and recreation which will broaden and sweeten their lives, has led to forming general libraries for special classes wherever people can be interested and command leisure to read. Owners of factories, stores, mines, and other employers have found it profitable to improve their employees' character and standards by furnishing such libraries. Governments put them in prisons, asylums, and other institutions. Cities send them to station and engine houses of police and fire departments.

College Libraries. In these circulation is subordinate to reference work, the most important feature being to teach students how to use books and to give opportunities to handle them with a freedom thought impracticable in a public library, though recent experience with open shelves has shown that the public can be trusted far more than was supposed. In modern work every department finds the library as necessary as its laboratory, so that the college library is not the rival but the best ally of every professor in the institution. Some normal schools and colleges give systematic instruction to their students in using books and in the mechanism of the library; not to train them as librarians, but to give them the ability to get the most from books and modern libraries.

Modern Movement. It was the chief duty of the old librarian to get and keep books. Their use was a subordinate consideration. The library was a storehouse. But the modern library is less a reservoir than a fountain. Its librarian is an active, aggressive factor in popular education. He recognizes fully his duty to get and to keep, but puts far above this his greater duty to use. The old library was of interest only to the learned few. The modern library has won an equal place beside the public school.

The present will be known to historians as the library age. In a single year 100 new general library laws have been passed by American States. In public interest and support, in liberality of laws and appropriations, in magnitude of individual gifts, the modern library movement exceeds any other in history. It meets not with jealousy and antagonism, but with sympathy and cordial support from those concerned with the other half of education, the schools.

The most potent and most economical influence to be exerted for good on young and old is through reading. It is the longest lever with which human hands have ever pried. Educational experts declare that the chief influence on the child is not father, mother, teacher, or school, but what he reads. This reading can be guided effectively and economically by free public libraries. The vast percentage of children are able to secure only the barest elements of education before becoming bread-winners. During life the rest is gained, whether of information or inspiration, from what they read.

The birth-year of active, new work, of the modern library movement, was 1876. In it was founded the American Library Association, a most potent national body. The *Library Journal* was established as its official organ. The Library Bureau, a centre for library enterprises, started its work, which has grown from a few hundred dollars the first year to over a million dollars annually, and has introduced card indexes and other labor-saving devices into a score of countries. Later the United States Bureau of Education published a volume of essays and statistics on public libraries in the United States. Cutter's Rules for a dictionary catalogue, and the decimal classification and relative index, appeared. In 1886 the *Library Journal* was supplemented by *Library Notes*, later replaced by *Public Libraries*, published since 1896 by the Library Bureau.

In 1893, at the Columbian Exposition, a national comparative library exhibit, prepared by the New York State Library, was a prominent feature in the United States Building. Similar exhibits, limited by lack of space, were made at the Paris Exposition of 1900 and the Pan-American of 1901. The *A. L. A. Catalog* of 5000 of the best books for a village library was a leading feature of the Chicago exhibit, and the

New York State Library took charge of its revision for the Saint Louis Exposition.

Significant of the new part public libraries are playing is the action of one of the shrewdest observers among mankind's greatest friends, Andrew Carnegie, who, in his avowed purpose of distributing his wealth for the greatest good of his fellows, finds nothing which promises so large returns as coöperation with communities which are willing to pledge themselves permanently to devote, from public funds or other sources, for the annual maintenance of a public library, one-tenth the sum given by Mr. Carnegie for a building. Up to January 1, 1903, Mr. Carnegie had given 730 libraries and had applications for 800 more, most of which he hoped to grant.

The clearest testimony that the great library movement is accepted as educational is found in the fact that circulating, subscription, and proprietary libraries have given way before the tax-supported free public library, just as the private and denominational schools have been so often replaced by the tax-supported free high school. All the important steps in the development of the school system have already been taken also for libraries; such as educating public sentiment, making libraries entirely free, giving grants and subsidies from public money, supervision, reports, professional journals, training schools and classes corresponding to normal schools and teachers' classes, institutes, inspectors; and, most important of all, establishing State library commissions, which will inevitably grow to State departments like that already established in New York. Two other steps are advocated to complete the correspondence: requiring librarians to attend institutes as a condition of receiving public library money, and requiring State certification of librarians as to fitness for their duties.

The conception of the library's scope and functions has broadened rapidly in recent years. The original library might be used by a privileged few. Then those who paid a fee might use it. Finally it was made free to all for reference. The thought of taking any book from the older libraries was as preposterous as that of borrowing specimens or pictures from a museum. Then the favored few might borrow, then all who paid a fee, and finally came the broad plan of lending free to all. Then the library became aggressive, and reached out to secure readers as earnestly as a merchant to secure patrons. When New York established its Public Libraries Department, there were 40 public libraries in the State and 40,000 licensed saloons, with chances a thousand to one that a boy at leisure would find the open door and cordial welcome of a saloon, instead of opportunity to read the best books. In competing with these rivals, branch libraries were established. But these did not get close enough to the homes in all cases, and deliveries were added. The express, mail, and telephone were used to make the best books more accessible. One or more books were lent to readers at a distance; then home libraries were sent out to local centres for groups of a dozen children. Traveling libraries of 50 or 100 volumes of the choicest books were sent to every community wishing them. The idea spread rapidly. The need of reaching rural homes too scattered for the larger collections led New York, in 1903, to offer the house library of 10 volumes. Book-wagons and cars with traveling librarians are now planned. Perhaps the most significant features of late years are the development of reference librarians to answer questions; of the children's room and librarians devoted wholly to the needs of little people; of free access to open shelves so that all readers may have the advantages of actually handling the books; provision for those who cannot come to the library, by means of branches and traveling libraries; and the appraisement or evaluation of books by disinterested authorities, so that a reader may have a trustworthy guide in selecting from the millions of books in existence the one best adapted to his needs.

Librarians largely agree that the best name for local tax-supported libraries is 'public library,' preceded by the name of the city or town. The word 'free' is objectionable as suggesting charity, and 'circulating' is unnecessary, for all libraries are understood to be for lending unless called 'reference.' The library has three functions: (1) As a storehouse; (2) as a laboratory for study and serious work; (3) as affording sane entertainment. Every complete library must have a reference and a lending department and general reading-rooms for periodicals. It should work in close touch with the schools, but under independent trustees. Efficiency and economy make it the natural home for collections in science, art, or history; for lectures, meetings of clubs, and all interests outside the schools which help on education and culture. Many Sunday-schools find it wiser to turn their books over to the public library, where Sunday-school teachers may meet during the week, with access to books, pictures, and all facilities for study. The library field is being rapidly enlarged in various directions.

Legislation aims to make it easy to establish and difficult to abolish libraries, to encourage gifts, to grant State aid to communities willing to help themselves, to collect the results of experience and make them available in print and by personal expert advice, to protect library property by stringent laws, and to recognize in every direction the library as on the same plane with the school.

Building. The location should be very near the business centre, but preferably on a side street just away from the turmoil of the main thoroughfare. In larger towns, branches and delivery stations should bring library facilities within easy walking distance of every home. For most libraries the heavy cost of fireproofing is needless, as most of their books can be readily replaced, and a vault or safe will hold their rarities. Small libraries often wisely occupy rented rooms; the order of importance being first a competent librarian, then the best books, and after these a building.

After the small rural building of one square room, the most obvious and successful types are shaped like capitals I, L, T, H, E, according to space required. The other types are the hollow square, the Greek cross, and E with middle arm omitted. Circular, spiral, and other peculiar buildings have won no acceptance, except that some advocate a round end having radial stacks with each shelf in view of the delivery desk. The Pittsburg branches afford excellent examples of this type.

Most small libraries now adopt the ⊥ or trefoil type. The book-room projects from the rear and has a cheap end wall for easy removal and extension. The main entrance in the middle front is into a central hall for loan desk and the less quiet work. In one arm is the reference or study room, in the other the children's room or periodical room. This general type gives best results for a given cost, and can be most cheaply administered.

The best library buildings are all recent. Of the large libraries, the Newberry of Chicago (1893), Boston Public (1895), Library of Congress and Chicago Public (1897), Providence Public (1900), Wisconsin Historical Society and Newark Public (1901), Washington (1902), are most often quoted; of university libraries, Columbia, Cornell, Illinois, Pennsylvania, and New York. Trustees may now wisely copy the plan that suits them best and make such changes as local needs demand. The modified plan should be submitted for criticism to some expert student of library buildings. State library commissions always give this aid, and the New York State Library School at Albany answers many such inquiries by suggestions in print. Trustees should be free to use any suggestions in any competitive plan by paying for them, instead of being compelled to choose some one plan as a whole and employ the successful anonymous competitor. A useful aid in fixing location of rooms is to cut cards to scale for the area of each room, and thus test various arrangements more quickly and plainly than by drawing plans. Brief general rules are: Plan each library specially for its work and community; care for interiors before exteriors; provide amply for future growth; plan for economy in administration by arranging rooms to allow supervision by the smallest possible staff; sacrifice no convenience for architectural effect; use no decoration that will attract sightseers to disturb quiet study-rooms. A model building might be said to be built around a standard catalogue card; for this card determines the size of trays and drawers, these of cases, and these determine spaces between windows and doors. Certain rooms must be near the card catalogue, because it is much too costly to duplicate even with printed cards; and the one catalogue must be close to reference-room, loan desk, and cataloguers. The plan should aim to give direct access to each department and be so obvious that people will know where to go. The general effect should be cheerful and hospitable. Experts advise omitting permanent partitions except where necessary for support, and depending on temporary partitions, chiefly of glass, which can be readily moved as growth and changes demand. These give spacious effect and much better light, and allow supervision from another room, while shutting off noise. An attendant may often control two or three rooms as cheaply as one, if rooms open together.

The smallest library starts with one room. The next need is a quiet study-room, free from the noise of issue and return of books and current work. The third room needed is usually one for children, which if possible should have an independent entrance, so they will not pass through the doors or corridors used by adults. On the main floor must be delivery and book rooms for quick service, children's room (unless in the basement), and, if space allows, rooms for librarian, cataloguers, and for reference. Above may go class, trustee, lecture, and other rooms used by fewer people or less often, both rooms and books most used being nearest the entrance. Basement and attic should both be made so they can be finished later for public use, for the rapid growth of libraries shows that they will surely be needed. Stairs should be inclosed or put to one side to lessen noise. Spirals cost more, waste room, are dangerous and inconvenient. Risers to stairs should be only 6½ or 6¾ inches for easiest use. For book-rooms, ceilings should be fifteen feet high to allow two decks. Ten or twelve feet will answer for other rooms. The most common error is in building on too small a lot. Ample space is needed for light and quiet, and for inevitable growth.

Book-Shelves. The rapid growth of libraries is a constant embarrassment. The most compact possible system of storage is still too costly. The lowest estimate for fireproof building is 30 cents per cubic foot, so that a building 30×50 feet and 40 feet high for two stories and high basement would cost $18,000. If half the whole building were given to close stacking of books it would hold in four decks only 60,000 volumes, making the cost of shelf-space 30 cents a volume, or if no reading-room and administrative space is allowed for, 15 cents a volume. But often fireproof construction is unnecessary. Rarities can be kept in the safe or fireproof vault. Other books can be readily replaced if burned. A simple frame building for 5000 volumes costs from $1000 to $2500. Brick and stone and better construction would cost two or three times this amount. Larger libraries must use a stack, i.e. shelving set as close together as possible and yet allow ready access by narrow aisles. Stacks are of iron or steel uprights with wood or sheet-steel shelves, and from one to ten stories or decks high, each deck carrying the weight of all above it, aisles always being exactly over aisles. Floors should be of thick glass, because it admits some light. Each deck is seven or eight shelves high, with aisles 75 cm. (30 inches) wide. Separate rooms for great subjects are very desirable, but in use cost more to administer than large central reading-rooms, where a single card catalogue and reference librarian can do the work that would require several on the department plan. In computing capacity of shelving, 33⅓ volumes to the running meter (10 to the running foot) are allowed for public libraries, with shelves crowded. Economy requires ample vacant spaces to insert additions, so that buildings must allow for two or three times the volumes on hand. In book-stacks with average aisles and windows, each square meter of floor surface will hold 200 volumes on each stack-level. The standard shelf is 25.5 cm. high and 20 cm. deep; 75 cm. (30 inches) is the best length. Some use 90 cm. (36 inches). Longer shelves, unless extra heavy, sag when heavily loaded. Wall-spaces should not be divided into aliquot parts, but into standard shelf-lengths. If the building has not been planned with due regard to these standard sizes, any remaining space should be occupied by a single odd length, which for symmetry may be in the centre. A 10-cm. base, to protect the lower books when floors are cleaned, is enough. On at least one side of a double case the first four shelves should be

35 cm. (14 inches) wide, the fourth shelf making a 15-cm. ledge 94 cm. above the floor. The first two shelves above the base should be movable, so that the three spaces for octavo books may be changed into two for quartos and small folios, or into one for folios and one for octavos. The four or five upper shelves are cheaper and stronger if fixed at octavo height, for most libraries now use relative location in which shelves are seldom moved. The best standard case is eight shelves (7 feet 8 inches) high and five tiers (13 feet 6 inches) long, and uprights two inches thick. On its two sides the 10 tiers of 80 shelves hold 2000 volumes in close packing. For a one or two deck stack wood is best and cheaper. Steel is necessary to carry the load of taller stacks. A good plan in growing libraries is to set the first cases with aisles 6 feet 4 inches wide, leaving room for narrow tables and convenient access by readers. When necessary this broad aisle allows a new case without ledge to be put in the middle and leaves the standard 75 cm. (30 inches) aisle on each side. Where the public has access to the shelves this wide aisle is very desirable. Doors are now never used on library shelves except for a few rarities. Aisles should be 75 cm. at the bottom between ledges. This will give above the ledge 90 cm. for single or 105 cm. for double-ledge aisles. Tall ladders have given way to galleries 75 to 100 cm. (30 to 40 inches) wide, as quicker and safer. All books should be within the natural reach of a person five feet high. The front edges of shelves and uprights should be rounded to save wear on bindings. A flanged groove on the shelf edge to hold labels saves buying metal label-holders. Before stacks or floor cases are put in, all wall-space within reach should always be shelved. A box-factory can make the cheapest possible temporary shelving at about 20 cents, 30 cents, 40 cents, and 50 cents for standard cases of one, two, three, and four compartments, each 75 × 20 × 25.5 cm. inside. These can be stacked in various combinations; on top of other cases, over doors and windows, and on each other to any height. Lath tacked on ends will prevent tipping. When no longer needed these shelves are worth nearly cost for packing-boxes.

When old buildings are adapted for libraries, extra floor supports must be put under bookstacks to carry the great weight. It is wiser, however, to build a wing for a stack with the weight directly on the ground.

Reading-Rooms. Three types are: (1) The quiet study or reference rooms for serious work; (2) periodical rooms with rustling newspapers and noise of constant coming and going; (3) children's rooms. As readers stay longest in the study-room, it can be put in the upper story, or at a point most distant from noise. Entrances to periodical and children's rooms should be as near the street as practicable, for convenience and to keep noise away from quiet rooms. Two square meters (20 square feet) of floor-space should be allowed each reader in study-rooms. Less space will suffice in the other two. Larger libraries need separate reading-rooms for art, patents, bound newspapers, and other large special collections. Small study-rooms are most costly to build and to supervise, and so are in little favor. Economy requires for general purposes a large central hall so that reference books and attendants need not be duplicated.

Special Rooms. Even small libraries need coat and toilet rooms near the entrance. Lavatories with hot and cold water are important, especially for children. Many come to a library dirty, and it is unwise to send them away if they want good books. In most places books are dusty and quickly soil the hands. There should be one room in which conversation is allowed. The library is a kind of intellectual clubhouse; and those who wish to play chess or other quiet games, discuss books, look at pictures, hold meetings of study clubs or classes, should have a place, as well as the reader demanding quiet. A separate trustees' room is usually wasteful, and if built should serve for some use not interfering with the infrequent trustees' meetings. A catalogue and work room is needed for all but small libraries. As work grows, various administrative rooms are demanded.

Light. Good daylight has become less essential since electricity is so widely used. Acetylene gas gains steadily in favor. Shelves should be set at right angles to or opposite windows, always putting backs of books where titles can be most easily read. Windows, preferably on the north or east side, where they avoid direct sunlight, should reach to the ceilings and have square tops, since light-area there is worth double that near the floor. In stacks, windows exactly opposite centres of aisles are best. Walls should be tinted with colors that reflect instead of absorbing light. In many cases there is ample space for windows above the shelving, but a prison-like effect is produced unless there are some windows at ordinary height. Bright general illumination with artificial light is needless in study-rooms. A reading-lamp should be on each table, the wire coming from below through a bored leg or suspended from the ceiling. Even the best lights on ceilings or distant from tables are injurious to sensitive eyes. White-lined green glass translucent shades are easiest for eyes, and give all general light needed in the room. If general lights are used, they should be so arranged that direct rays do not reach the eye. Heat and ventilation are specially important in study, periodical, and children's rooms, and about the loan desk.

Furniture and Fittings. Except to deaden the noise in special places, avoid carpets and rugs because unsanitary in public buildings. Tile and marble floors are noisy and cold. Interlocking rubber tile is good, but is costly. Corticine and linoleum have proved for a generation the best library floor-covering. A lift should run from the unpacking room in the basement to the catalogue room above, and to the top floors if books are often sent there. Call-bells should be single-stroke, not buzzers, to avoid noise and admit of convenient codes of signals. The wooden sounder or a mere click is preferable to the common bell. These devices save much time and needless walking that annoys readers.

Tables and desks for readers should be 78 cm. high from the floor, not 75 cm. as is usual. With chairs of various heights and footstools, these are adapted to short people as well as tall; but tall people cannot sit comfortably at low tables. Large tables for a dozen people are objectionable. The best sizes are 60 × 100 cm. (24 × 40 inches), 75 × 120 cm. (30 × 48 inches), and 100 × 150 cm. (40 × 60 inches). Bentwood chairs are light, strong, and so durable as to be cheaper than lower-priced ones. Rubber tips for chair-legs are needed on bare floors.

LIBRARY ADMINISTRATION.

The work of the larger libraries falls naturally into the following departments:

EXECUTIVE. Seven hours daily is the limit of good work in cataloguing and similar steady, exact work. Eight hours are usually required of attendants having a margin of free time. Libraries which have studied results most closely give a full month's vacation with pay, and some allow one additional month during the year for total absence from illness or other causes. Salaries are steadily working upward, with the demand for higher qualifications and fuller training. Small rural libraries may be kept open a few hours a week for $100 to $300 a year. The great libraries now pay $5000 or more to their directors. The tendency is to open libraries on holidays, Sunday afternoons, evenings, and earlier in the morning. Forenoon use is so comparatively small that if the staff is not large enough for relays the public is convenienced more by afternoon and evening opening. Where practicable, hours are from 8 A.M. to 10 P.M. Closing for annual inventories is needless under a proper system.

ACCESSION DEPARTMENT. This includes the whole subject of selecting and getting books and other material, gifts, sale or exchange of duplicates, plating, 'pocketing,' and writing the accession book. This is a business record, giving on one line for each volume in the library a record of the life history of that special volume. This accession book shows total volumes added to the library, and the accession number placed on the first right-hand page after the title of each book is the quickest and most accurate means of identification. For cataloguing department, see CATALOGUING; for classification, see below.

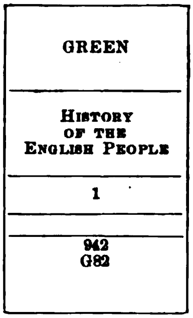
REFERENCE DEPARTMENT. Systematic aid to readers is given by means of an information desk or reference librarian. In larger libraries the demand has led to adding various assistants who devote their time to answering questions, helping readers to find what they wish, and incidentally showing them how to use bibliographies and catalogues for themselves. The children's librarian is one of the most useful. Larger institutions are developing a library faculty of specialists, each assisting readers in his special field.

The rapid development of reference work comes from recognizing the library as an educational centre. The room of a skillful reference librarian, surrounded by the best reference books supplemented with card indexes, notes, and the rapidly increasing bibliographic devices, becomes like an enlarged universal encyclopædia. Such a librarian not only answers questions on every conceivable subject and utilizes French, German, and probably other languages freely, but also teaches applicants how they may find out for themselves next time, and thus in time develops the ability to use to the best advantage a well-equipped library. This department becomes the information bureau for its whole constituency. Some investigations require considerable time and are not in their nature of such public value as to be justifiable at public expense. These are made for any one willing to pay the pro rata cost of the assistant's time. This gives free use of all library resources and facilities and protects against using the time of public officers for private purposes.

Free access to the shelves is becoming more common, and in most libraries serious students have no difficulty in getting shelf privileges.

LOAN DEPARTMENT. Many libraries allow a second book to be lent, not fiction. For special investigations it is easy to get permits for an extra number of copies or for extra time. Loan records are kept on cards. Books may be reserved, and notice is freely sent when books asked for are ready. Interlibrary loans are common. A lending library has ceased to be a mere storehouse, but aims to induce its readers to borrow better books by restricting the supply of the less desirable and inciting interest in the best by annotated lists in newspapers and on slips for free distribution, by illustrated bulletins, by personal suggestions, and by shelves open freely for all to browse among tempting books. Immense gains have resulted from these systematic, intelligent, sympathetic efforts to improve the average of books lent.

BINDING DEPARTMENT. Public libraries care chiefly for durability, and demand the best materials, methods, and work; tight backs, vellum instead of leather corners, signatures sewed all along and laced in boards, Turkey morocco, cowhide, duck, or muslin according to amount of wear. Genuine Turkey more than pays its extra cost in wear. Books specially exposed to heat are safer in vegetable fibre like duck, as heat disintegrates leather. Sheep, calf, Russia, and all fancy materials and tooling are avoided. Back lettering should be: (1) author's name (at top); (2) title of book; (3) volume number; (4) class and book (call) number, about 5 cm. from the bottom where it will not be worn by the hand, e.g.:



Many libraries in addition stamp their name at the extreme bottom. See also BOOKBINDING.

SHELF DEPARTMENT. This has entire charge of arrangement and preservation of books, and all other material. It must keep all the library collections in order and clean, and find or replace missing books. A complete inventory is taken once a year, but well-managed libraries no longer close for this purpose, but distribute the work of stock-taking and cleaning throughout the year. The inventory is called a shelf-list. This has class, book, volume, and accession numbers, author, and brief title of every book, written on loose sheets laced together in a binder, or on cards arranged in the order in which the books stand on the shelves. It forms a brief and very convenient subject catalogue. As this is the check list for losses, the old rule was not to allow it on cards, which could be removed by a book-thief without detection except by accident. As books are constantly added, a bound book is impracticable because of frequent recopying, and even with the small sheets 10 × 25 cm. holding only 20 titles each the labor has led many libraries to take the greater risk of cards.

In the relative system, now almost universally preferred, shelves require no numbers, the class numbers being the sole guide. For greater legibility these are often printed large on movable label-holders. If shelves are numbered, the plan should be so comprehensive that numbers signify position as well as sequence. Here as everywhere numbers must run from top to bottom and left to right, to read as the columns of a newspaper are read, e.g. 2435.8 might mean second floor, fourth room or face, third tier, fifth shelf from the top, and eighth book from the left-hand end. The unit figure should uniformly represent a height the same distance from the floor, so that one seeking a shelf ending in 5 knows on what level to look.

Janitorial Department. Feather dusters merely redistribute dust. Damp cloths can be used in many places and moist sawdust scattered over the floor in sweeping collects the dust in little balls. Books are cleaned by slapping them sharply together over a shallow pan of water which catches the dust. Some libraries have an air-shaft with strong exhaust, so that books may have the dust jarred off and carried away by an air-current. A recently invented portable exhaust with rubber hose sucks out all dust thoroughly by running the nozzle over the tops of the volumes. The best protection against fire is an ample supply of fibre or metal buckets kept filled with water, and kept in plain benches with hinged covers. Raising the cover exposes the entire line of full pails, which are less likely to spill than when taken down from high racks. Hand grenades lose their power with age. As books are easily damaged by water, dry powder extinguishers are specially adapted to libraries. Insurance authorities have tested and approved three of the scores of appliances for mixing sulphuric acid quickly with soda and water, thus making the best of chemical extinguishers. A pattern should be chosen without rubber pipes, which harden with age, or valves, which are apt to stick. But prevention of fire is more important than extinction. The greatest danger is from imperfect electric wiring. For unlighted corners candles are safer than oil lamps. Steam or hot water heat with a single fire and flue is much safer and cleaner than stoves, furnaces, or fireplaces.

Library Classification. Books alone are no more a library than boxes of type or dictionaries of words are poems. A collection of books must be classified before it deserves the name library.

Classification is putting like things together. Each book, pamphlet, clipping, map, or other item goes with any others like it on a carefully systematized plan, so that matter most closely allied and oftenest used with it will precede or follow closely. Only thus can all reasonable demands of readers be met fully and promptly. The vital importance of classification has long been recognized. Alexander Bain says, "To learn to classify is in itself an education." But practical difficulties were so grave as largely to neutralize advantages. It is an almost endless work to prepare a complete scheme, and when done it never wholly suits the maker, much less any one else. To avoid the inevitable delays and confusion of these elaborate systems, some libraries were arranged in order of acquisition, some by authors like a directory. Usually there was coarse classification by subjects, and librarians and readers did the best they could to find their resources by aid of bibliographies, subject catalogues, and indexes. Some classifications had no indexes. Others referred to pages of scheme on which subjects might be found. The book number itself indicated a fixed location on a particular shelf and had to be altered as often as growth made it necessary to move that subject.

The great desideratum was a system that would do away with the expensive necessity of renumbering books whenever their location was changed. This was provided in 1876 by the publication of the *Decimal Classification and Relative Index*, which showed by the same number both subject and location. This scheme divided the field of knowledge into nine main classes, numbered 1 to 9. Encyclopædias, periodicals, etc., so general in character as to belong to no one of these classes, are marked 0 and form a tenth class. Each class is similarly separated into nine divisions, general works belonging to no division having naught in place of the division number. Divisions are similarly divided into nine sections and the process is repeated as often as necessary, the full tables covering some 20,000 topics.

Books on the shelves and cards in the subject catalogue are arranged in simple numerical order, all class numbers being decimal. Since each subject has a definite number, it follows that all books on any subject must stand together. The tables show the order in which subjects follow one another, 512 algebra preceding 513 geometry, and following 511 arithmetic. Of this E. C. Richardson says in his *Classification, Theoretical and Practical* (pages 199-200), published by Scribners in 1901:

"This system has probably had more vogue than any other bibliographic system ever published save possibly that of Brunet. Taken as a whole and regarding the substantially unchanging form and notation, among the multitude of derived systems with minor variations, it is undoubtedly true that no system ever invented has been applied to as many libraries (probably at the present day several thousand) as this. In many libraries considerable changes have been made, but in the majority it remains practically unchanged. It is now being adopted very generally on the Continent of Europe by booksellers even as well as libraries, and is of late, through its adoption by the Brussels Institute (for international bibliographic work), having a very zealous propaganda by its converts, especially in France and Italy. Many of the most noteworthy partial classifications of the present day are avowedly founded on and are enlargements of this system. The system itself is supposed to be in some way an adaptation of Bacon, but the relation is hardly to be discovered and it really should be counted as independent. The reasons for its deserved popularity are to be found: (1) In an intelligent and consistent application of the decimal notation (not new with Dewey, but first by him vigorously and consistently applied); (2) in the grasp of mnemonic possibilities of this situation; (3) in the practical, intelligent, and often up-to-date management of the remoter subdivisions of the, in some places, somewhat artificial, larger sub-classes; (4) in the fully printed schedules with their 'relative index,' which more than anything else is the cause of the practicality of this system and its wide adoption. In other words, its popularity has been due to intelligent practical usefulness."

The user of a library as a rule has no interest or knowledge as to theories of the scheme used. His concern is to find quickly any subject wanted and to find near it other closely allied subjects which he is also likely to consult. Experience proved the proposed change from fixed to relative location practical. This solved most of the difficulties, so that in recent years most libraries careful in deciding on methods adopt the most important characteristics noted below as recognized essentials in a satisfactory library classification.

RELATIVE INDEX. The card catalogue is rapidly displacing the book form. The former could not be indexed like a book by reference to pages, for cards to which additions are made daily could not be numbered like pages. The solution for classed catalogues was to number subjects so that the entry in the relative index was followed by a number which meant not a page of a special book, but a subject in the complete scheme; e.g. geometry in the index is marked 513, meaning Class 5 Natural Science, Division 1 Pure Mathematics, Section 3 Geometry. This relative index number is a key to card catalogue, shelves, pamphlet collections, shelf-list, charging system, newspaper clippings, manuscript notes, in fact to everything arranged on the relative system. Books and other material are arranged in simple 1, 2, 3 order, and the old numbers indicating a fixed location are wholly abolished because this relative index number shows not only what subject the book treats, but also exactly where it may be found. Old numbers were frequently changed, while relative numbers, being permanent, are gilded on book-backs.

CLOSE CLASSING. All recent experience strongly confirms the wisdom of close classification on shelves, and the practice has so changed that what twenty years ago was called extreme close classification would now be considered medium or even coarse. Where libraries depend on catalogues and indexes for the resources on any subject it usually results, after a few years, in doing the work over at greatly increased cost. The best results can be obtained only by having as far as physically practicable material on each definite subject standing together. Lists of books printed as guides to readers are now usually closely classified.

CLASSIFICATION IN ADVANCE BY EXPERTS. By the relative index the number of each minute topic shows the exact place to which it has been assigned by a recognized authority in that field. A classifier need have no knowledge of the general subject if he knows exactly what a book is about. Turning to that topic or any of its synonyms in the index, he finds its number, which, marked on book, cards, and elsewhere, gives expert classification with a minimum of labor. When this book is wanted any assistant who knows what topic is sought repeats the process, finding almost instantly the index number which guides to book or catalogue entry in 1, 2, 3 order.

SIMPLE NOTATION. In any plan the system of numbers is of the utmost practical importance. Extreme simplicity is necessary for rapid and accurate use by readers and attendants. Only Arabic numerals and Roman letters are sufficiently simple and familiar to be available. Most libraries use nothing but figures to number subjects. The expansive system by C. A. Cutter combines letters and figures. The 26 letters allow 676 combinations with two characters or 17,576 with three, and as compared with Arabic numerals have 18, 46, and 118 times the capacity for three, four, and five characters. This is a great advantage, but produces numbers very unusual and complicated in appearance. The expansive is the best of the letter systems and the only one used by any number of libraries. Both expansive and decimal systems meet the test of a good classification in insuring that books on the same subject shall be classed together and readily found when wanted.

BOOK NUMBERS. Mr. Cutter is also author of an ingenious and widely used table to keep books in each class in alphabetical order. The author's initial is followed by a number which is the translation into figures of the rest of the name, so that the system is much simpler in handling and recording than it would be if the author's whole name had to be used. For scientific and other books where chronologic order is preferable, W. S. Biscoe, of New York State Library, devised a translation scheme by which a letter followed by simple Arabic numerals indicates date. Under the subject or class numbers most libraries use Cutter numbers, while many use also Biscoe numbers for science and useful arts. Some use simple accession order.

MNEMONICS. Both decimal and expansive systems made large use of practical mnemonics. These are of much use, especially in geographic divisions, languages, and form distinctions; e.g. since in the decimal classification German is invariably 3 and grammars 5, one knows without reference to tables or index that in class 4 philology German grammars must be 435. Library attendants are greatly aided by these mnemonic features and can often construct a number instantly. The principle also allows very minute subdivisions of topics where it is needed for detailed notes of specialists, as in limited divisions of historical periods. In history, 0 after the number for country means no further geographic subdivision and that the figure following denotes time; e.g. 942 is history of England (class 9 history, division 4 Europe, section 2 England), 0 indicates no further geographic division, 6 the sixth or Stuart period, 1 the first Stuart King, so that 942.061 means history of England in the reign of James I. (1603-25). Or, still further, a specialist may be collecting material on Norfolk under James I. If so 061, the number for reign of James I., added to 942.61 (Norfolk), making 942.61061, would indicate with absolute precision and in a language understood all over the civilized world exactly the time and place. The wide adoption of this decimal classification for international use was based on the fact that it was a universal language used with equal readiness by all nations, while words would often be confused and misinterpreted as they were transferred from one tongue to another.

ASSIGNING CLASS NUMBERS. The content or the real subject of which a book treats, not the literary form or wording of the title, determines its place. A history of mathematics goes with mathematics, not with history. Every book should be assigned to the most specific head that will contain it, according to its predominant tendency or obvious purpose and also the nature and specialties of the library. Translations, reviews, analyses, and other books about specific books should be classified with the original books, as being most useful there.

DEVISING NEW SCHEMES. The relative index and relative location, and closer classification than was thought possible before their invention, are now generally accepted. Experienced librarians uniformly advise against making new schemes, as the labor and cost are so excessive. The result is never wholly satisfactory, and the same time and money spent in other directions would do much greater good to the library. Schemes already laboriously worked out are freely at the disposal of all, and there is also the very great advantage in adopting a scheme used by many other libraries that catalogues, indexes, and notes are interchangeable, and that many accessories have been prepared and printed and can be cheaply obtained that could be had for an independent scheme only at a cost so large as to be prohibitive.

LIBRARY SCHOOLS AND TRAINING. When near the close of the last century librarianship was recognized as a profession, it became clear that it had the same need for professional schools as law, medicine, or teaching, but nowhere was there offered systematic training for this important field. May. 7, 1883, Melvil Dewey's plan for a library school with a statement of need of it was presented to the trustees of Columbia University. There was a growing call for trained librarians animated by the modern library spirit. There were in the United States 5000 public libraries, large and small, whose efficiency experts agreed could be doubled by skillful administration. Young college graduates of unusual promise were ready to enter the new profession, but no adequate facilities for training were offered. In 1884, after a year's consideration, Columbia voted to establish the school, which was opened January 5, 1887. The three months' course was by petition lengthened to four, and then to seven months, and then at once to two years, thus proving a demand for technical training not only larger than estimated, but also for broader and more thorough work than that originally planned. On April 1, 1889, by agreement between Columbia and the State, the school was transferred to the State Library at Albany. Library schools in charge of graduates of the parent school were opened in 1890 by Pratt Institute, Brooklyn, in 1892 by Drexel Institute, Philadelphia, in 1893 by Armour Institute, Chicago. When in 1897 the University of Illinois erected its finest building for the library and determined to make library training a special feature, it arranged for the transfer to the State of Armour Institute School with its faculty and collections. The New York School since 1902 requires for admission a degree from a registered college. The Illinois State School in 1903 raised its requirements from two to three years of college work for admission. The degree of B.A. in library science is given at the end of four years' college work, the last of which is devoted to library science. The degree of bachelor of library science requires two full years of work besides the three years of college work. Pratt and Drexel Institute schools admit high-school graduates, and do not offer degrees. Like law and medical schools, a library school offers only a technical course, making no attempt to give general culture or supply deficiencies in earlier education. It gives only an outline treatment of historical and antiquarian topics, devoting its time to preparing its students for as valuable service as possible in their chosen field. A course includes bibliography, cataloguing, classification, work of accession, loan and shelf departments, bookbinding, library buildings, administrative, supervisory, and State commission work, selection of books, general library methods and appliances. As practical training is the chief end, seminars, problems, study of libraries in operation, and other features are used in such proportion as experience has shown to give the best results. Practice work in all the different departments under careful supervision is an important factor.

The arduous work of the modern librarian demands more than ordinary capacity and executive ability, and also health, energy, and tireless industry. Besides these natural qualifications, the candidates should be college-bred because: (1) They are a picked class, selected from the best material throughout the country; (2) college training has given them a wider culture and broader view with a considerable fund of information, all of which is valuable working material in a library as almost nowhere else; (3) a four years' course successfully completed is the strongest voucher for persistent purpose and mental and physical capacity for protracted intellectual work; (4) experience proves that college discipline enables the mind to work with a quick precision and steady application rarely otherwise gained.

Several large libraries have regular training or apprentice classes. Younger staff members and sometimes applicants for positions are organized in a class, assigned a teacher, and trained for several months in order to make them more efficient. Such classes are not open to the public, and do not pretend to be library schools; but in a large library systematic class instruction is much cheaper and more effective than to have high-priced assistants losing time in individual explanations. Many colleges and normal schools give library and bibliographic courses, not to train librarians, but to teach their students how to utilize a large library, how to care for their own private libraries, and to give them a knowledge and interest that will qualify them to serve intelligently as library trustees.

Another form of instruction is for library organizers, members of commissions, or missionary librarians to meet for a day librarians needing assistance and answer questions and make suggestions. The name 'institute' has been used for such 'round table' work, but should properly be limited to work corresponding closely to ordinary teachers' institutes where most of the week is given to systematic short courses under expert conductors. In 1902 New York was divided into 11 districts and the first systematic institute work successfully begun.

LIBRARY ASSOCIATIONS AND CLUBS. The first convention of librarians was held in New York, September 15-17, 1853, with 53 delegates. The next was held in Philadelphia, October 4-6, 1876, with 103 delegates. At the close, the American Library Association, of which the object is "to promote the welfare of libraries in America," began its work, which has grown steadily in scope and usefulness. Its annual meetings alternate between East and West, usually from Boston to San Francisco, and from Montreal to New Orleans. Its largest attendance is over 1000. In intervals between meetings its work is carried on by the committees, the council of 32, or the executive board of 7. It has sections devoted to special interests, e.g. college, reference, State library, trustees. Its most important branch is the American Library Association Publishing Board, consisting of five members who have charge of preparing and publishing bibliographies and other specially needed library aids. Funds for this board were raised by small subscriptions till in 1902 Andrew Carnegie made a first large gift of $100,000. The Board publishes various indexes and other helps to librarians, and annotated lists of the best books, for which George Iles has furnished the chief inspiration and most of the funds. Through it the experience of the library profession on many matters is focalized, formulated, and made available to all. At the close of the first international conference of librarians, held in London, October 2-5, 1877, at which 22 Americans were present, the Library Association of the United Kingdom, later chartered as the Library Association, began its work. It holds annual meetings at central points in the three kingdoms, and its Council holds monthly meetings in London. It gives much more attention to the antiquarian and historical side of library work than the American Association, whose activities have been almost wholly directed to establishing new libraries, improving methods, reducing cost, and other directly practical ends. The National Library Association of Australasia was founded in 1896, in 1900 the Verein Deutscher Bibliothekäre was founded in Germany, and in 1901 the Kansai Bunko Kyōkai or Western Library Association was established in Japan with *Tōheki* as its official organ. In half a dozen other countries, notably Italy, France, and Denmark, growing interest in the modern library movement indicates early organization. The first State Library Association was organized in New York in 1890, followed rapidly by other States, till now nearly all have such organizations.

Interstate meetings are becoming more common, because they reach large numbers in certain sections unable to afford time and cost of journeys to national meetings at distant points. New York holds an annual 'Library Week' for the Northeastern States and Canada, the last full week in September, at Lake Placid Club in the Adirondacks, which draws delegates from numerous other States. The Pennsylvania and New Jersey associations for many years have held a joint meeting, to which others are invited, at Atlantic City, N. J., for three days late in March. Another central meeting-point is Madison, Wis., where some of the best public-library work of the country has been done by the efficient State Commission.

In 1885 the New York Library Club, the first local body devoted to library interests, was started. Chicago followed in 1891, and now local clubs are found in most of the large cities and are being established also for groups of counties where the need is felt for more frequent meetings and closer contact than is provided by the State associations.

While delegates from different countries frequently attend national meetings, the distinctly international library conferences have been in London (1877), Chicago (1893), at the Columbian Exposition, London (1897), at the Queen's Jubilee, and at the Paris Exposition of 1900.

State Supervision, Grants, and Subsidies. Most of the States have now appointed library commissions, usually of three or five persons serving without salary, but often with a paid secretary or organizer. These commissions have charge of the State's public library interests. They are recognized as transitional, and are paving the way for establishment, as an essential part of State government, of a library department corresponding closely to the educational department. At present these commissions answer questions, help in selecting books, give suggestions and advise as to buildings, methods, and rules, and in several States make grants of books or money to new libraries. New York first of any State or country organized a distinct library department, under the law of May 1, 1891. It grants for buying approved books as much as is raised from local sources, up to $200 annually. The law also allows grants from local money up to 10 cents for each volume circulated, but supervision is more strict than elsewhere. All books bought with State money must be approved by the Public Libraries Division of the State Library, and the recorded circulation on which subsidies from local funds are granted must be certified as conforming to a proper standard.

Bibliography. *American Library Association Papers*, prepared for the World's Library Congress held at the Columbian Exposition, ed. by Melvil Dewey (Washington, 1896), United States Bureau of Education, free; Burgoyne, *Library Construction, Architecture, Fittings, and Furniture* (London, 1897); Dana, *Library Primer* (Chicago, 1899); Dewey, *Library School Rules; Card Catalog Rules, Accession Rules, Shelf List Rules* (3d ed., Boston, 1894); Grasel, *Manuel de bibliothéconomie* (Paris, 1897); Greenwood, *Public Libraries: A History of the Movement and a Manual for the Organization and Management* (4th ed., London, 1891); *Library Journal* (New York, 1877 et seq.), the monthly journal of the American Library Association; Macfarlane, *Library Administration* (London, 1898); Maire, *Manuel pratique du bibliothécaire* (Paris, 1896); Plummer, *Hints to Small Libraries* (2d ed., revised and enlarged, New York, 1898); *Public Libraries*, a monthly review of library matters and methods (Chicago, 1896 et seq.); Spofford, *Book for All Readers, Designed as an Aid to the Collection, Use, and Preservation of Books, and the Information of Public and Private Libraries* (2d ed., New York, 1900). Probably the most important books and articles on classification are: Edwards, "Classificatory Systems," in his *Memoirs of Libraries*, vol. ii. (London, 1859); Petzholdt, "Bibliographische Systeme," in his *Bibliotheca Bibliographica* (Leipzig, 1866); Kephart, "Classification," in *American Library Association Papers at Columbian Exposition, 1893*, a survey of methods in larger American libraries, published by the United States Bureau of Education (Washington, 1896); J. D. Brown, *Manual of Library Classification and Shelf Arrangement* (London, 1898); Richardson, *Classification, Theoretical and Practical* (New York, 1901); Dewey, *Decimal Classification and Relativ Index* (6th ed., Boston, 1899); Cutter, *Expansive Classification*. Also articles in *Library Journal* and *Bulletins de l'institut international de bibliographie* (Brussels, Belgium).

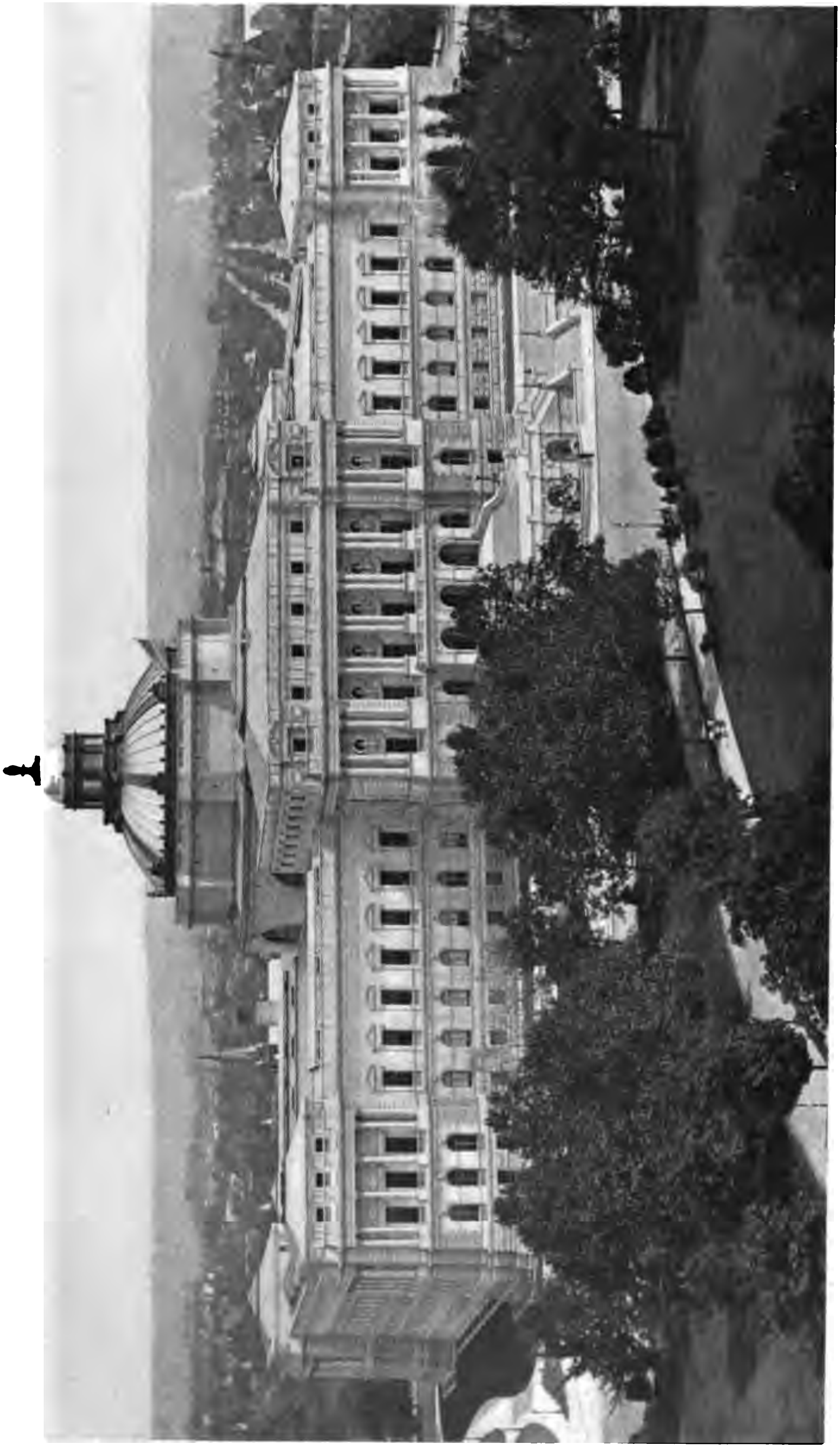
LIBRARY STATISTICS

No.	Library	City	Country	Date*	No. of vols.
1	Bibliothèque Nationale	Paris	France	1894	2,600,000
2	British Museum	London	England	1900	2,000,000
3	Imperatorskij Publicnaja Biblioteka	Saint Petersburg	Russia	1902	1,330,000
4	Königliche Bibliothek	Berlin	Prussia	1902	1,200,000
5	Library of Congress	Washington	D. C.	1900	1,000,000
6	Kön. Hof- u. Staatsbibliothek	Munich	Bavaria	1902	1,000,000
7	K. u. k. Hofbibliothek	Vienna	Austria	1901	900,000
8	Universitäts- u. Landesbibliothek	Strassburg	Alsace	1902	814,000
9	Public Library	Boston	Mass	1902	812,264
10	Publičnyj i Rumjancovskij Musej	Moscow	Russia	1900	800,000
11	Public Library	N. Y. City	New York	1902	787,775
12	Bodleian Library	Oxford	England	1900	600,000
13	Biblioteca Nacional	Madrid	Spain	1901	600,000
14	K. u. k. Universitäts-Bibliothek	Vienna	Austria	1901	596,525
15	Harvard University Library	Cambridge	Mass	1901	575,888
16	Det Store Kongelige Bibliothek	Copenhagen	Denmark	1895	550,000
17	Cambridge University Library	Cambridge	England	1900	550,000
18	Universitäts-Bibliothek	Göttingen	Prussia	1902	506,812
19	Kön. Bibliotheek	The Hague	Netherlands	1892	500,000
20	Universiteit Bibliotheek	Amsterdam	Netherlands	1892	500,000
21	Universitäts-Bibliothek	Leipzig	Saxony	1892	500,000
22	Bibliothèque Royale	Brussels	Belgium	1902	500,000
23	Regia Biblioteca Nazionale Centrale	Florence	Italy	1901	488,207
24	Advocates' Library	Edinburgh	Scotland	1902	485,000
25	Bibliothèque de l'Université	Paris	France	1897	477,590
26	N. Y. State Library	Albany	New York	1902	476,437
27	Magyar Nemzeti Muzeum	Budapest	Hungary	1900	467,000
28	Grossherzogliche Hof-Bibliothek	Darmstadt	Hesse	1902	460,000
29	Königliche öffentliche Bibliothek	Dresden	Saxony	1902	460,000
30	Bibliothèque de l'Arsenal	Paris	France	1892	454,000
31	Imperatorskij Varsavskij Universitet	Warsaw	Russia	1898	453,728
32	Kön. Bayerische Ludwig-Maximilians-Universitäts-Bibliothek	Munich	Bavaria	1902	450,000
33	Biblioteca Nazionale Marciana	Venice	Italy	1902	405,098
34	Grossherz. Ruprecht-Karls-Universitäts-Bibliothek	Heidelberg	Baden	1892	400,000
35	Imperatorskaja Akademija Naük	Saint Petersburg	Russia	1900	400,000
36	Kongl. Biblioteket	Stockholm	Sweden	1902	395,000
37	Kön. Eberhard-Karls Universitäts-Bibliothek	Tübingen	Württemberg	1902	890,000
38	R. Biblioteca Nazionale	Naples	Italy	1902	374,755
39	Kongelige Frederiks Universitet Biblioteket	Christiania	Norway	1902	372,000
40	Yale University Library	New Haven	Conn	1902	360,000
41	Bibliothèque de l'Université de l'Etat de Gand	Ghent	Belgium	1900	357,254
42	Kön. Julius-Maximilians-Universitäts-Bibliothek	Würzburg	Bavaria	1898	350,000
43	University of Chicago	Chicago	Ill	1899	350,000
44	Universytet Jagiellonski w Krakowie	Cracow	Galica	1901	344,715
45	Biblioteca Nazionale Centrale Vittorio Emanuele	Rome	Italy	1900	337,632
46	Stadtbibliothek	Hamburg	Germany	1902	335,000
47	Columbia University Library	N. Y. City	New York	1902	327,622
48	Kön. Landesbibliothek	Stuttgart	Württemberg	1902	326,131
49	Kön. öffentliche Bibliothek	Bamberg	Bavaria	1902	323,958
50	Landes-Universitäts-Bibliothek	Rostock	Mecklenburg	1899	318,000
51	Tokyo Teikoku Daigaku (University)	Tokio	Japan	1902	317,935
52	Imperatorskij S. Peterburgskij Universitet	Saint Petersburg	Russia	1902	306,727
53	Public Library	Chicago	Ill	1902	306,601
54	Kön. Universitäts-Bibliothek	Breslau	Prussia	1902	305,000
55	Public Library	Brooklyn	New York	1902	303,801
56	Herzogliche Bibliothek	Wolfenbüttel	Brunswick	1892	300,000
57	Bibliothèque Mazarin	Paris	France	1893	300,000
58	Kongelige Universitetet	Upsala	Sweden	1897	300,000
59	Kjöbenhavns Universitet	Copenhagen	Denmark	1898	300,000
60	R. Biblioteca Palatina	Parma	Italy	1902	299,404
61	Public Free Libraries	Manchester	England	1901	292,167
62	Rheinische Friedrich - Wilhelms-Universitäts-Bibliothek	Bonn	Prussia	1902	287,500
63	K. k. Karl-Ferdinand-Universitats-Bibliothek	Prague	Bohemia	1901	278,623
64	Stadtbibliothek	Frankfort	Prussia	1902	277,687
65	Birmingham Free Libraries	Birmingham	England	1902	272,166
66	Imperatorskij Moskovskij Universitet	Moscow	Russia	1902	271,926
67	Grossherz. Bad. Albert-Ludwigs-Universitäts-Bibliothek	Freiburg i. Br.	Baden	1902	270,000
68	Bibliotheca Nacional	Rio de Janeiro	Brazil	1902	259,404
69	Trinity College Library	Dublin	Ireland	1900	257,317
70	Regia Università degli Studi	Bologna	Italy	1895	255,000
71	Newberry Library	Chicago	Ill	1902	251,743
72	Kön. Albertus-Universitats-Bibliothek	Königsberg	Prussia	1902	250.395
73	Biblioteca Apostolica Vaticana	Rome	Italy	1893	250,000
74	Gornyj Institut	Saint Petersburg	Russia	1901	250,000
75	Cornell University Library	Ithaca	New York	1902	250,000
76	Bibliothèque Cantonale	Lausanne	Switzerland	1902	250,000
77	Biblioteca Nazionale	Turin	Italy	1902	250,000
78	Rijks-Universiteit	Utrecht	Netherlands	1902	250,000
79	Kön. Christian-Albrechts Universitäts-Bibliothek	Kiel	Prussia	1901	246,810
80	Grossherzogliche Bibliothek	Weimar	Saxe-Weimar	1902	240,000
81	Free Library	Philadelphia	Pa	1901	239,183
82	Budapesti Királyi Magyar Tudomány - Egyetem (University)	Budapest	Hungary	1901	236,881
83	Imperatorskij Novorossijskij Universitet	Odessa	Russia	1902	232,000
84	Library Company	Philadelphia	Pa	1902	231,184
85	Mercantile Library	N. Y. City	New York	1901	230,541
86	Princeton University Library	Princeton	N. J	1901	230.100
87	Oeffentliche Bibliothek	Basel	Switzerland	1901	230,000
88	Biblioteca Nazionale Braidense	Milan	Italy	1901	228,648

No.	Library	City	Country	Date*	No. of vols.
89	Vereinigte Friedrichs-Universität Halle-Wittenberg.	Halle	Prussia	1902	228,000
90	London Library	London	England	1901	220,000
91	Grossherzogliche Regierungsbibliothek	Schwerin	Mecklenburg	1901	220,000
92	Sutro Library	San Francisco	Cal.	1902	220,000
93	Public Library	Liverpool	England	1902	217,630
94	Biblioteca Comunale	Palermo	Italy	1897	216,000
95	Public Library	Cincinnati	Ohio	1901	215,558
96	Kön. Friedrich-Alexanders Universitäts-Bibliothek	Erlangen	Bavaria	1902	213,800
97	Central Public Free Library	Leeds	England	1901	212,396
98	Ἐθνικὴ Βιβλιοθήκη τῆς Ἑλλάδος	Athens	Greece	1902	212,000
99	Enoch Pratt Free Library	Baltimore	Md.	1901	211,449
100	Imperatorskij Kazanskij Universitet	Kasan	Russia	1901	211,196
101	University Library	Edinburgh	Scotland	1900	210,000
102	University Library	Glasgow	Scotland	1900	210,000
103	Bibliotheca Nacional	Lisbon	Portugal	1894	209,415
104	Imperatorskij Jurjevskij Universitet	Dorpat	Russia	1901	209,090
105	Biblioteca Governativa	Lucca	Italy	1901	207,794
106	Biblioteca Comunale	Fermo	Italy	1901	206,150
107	Universidad Central de España	Madrid	Spain	1895	206,134
108	Imperial Library	Tokio	Japan	1902	205,953
109	University of Pennsylvania Library	Philadelphia	Pa.	1902	202,500
110	Boston Athenæum	Boston	Mass.	1902	202,166
111	Grossherzoglich- und herzoglich Sächsische Gesamtuniversitäts-Bibliothek	Jena	Saxe-Weimar	1892	200,000
112	Staats-, Kreis- und Stadtbibliothek	Augsburg	Bavaria	1893	200,000
113	Museum Království Českého	Prague	Bohemia	1898	200,000
114	Bibliothèque Publique	Bordeaux	France	1900	200,000
115	Kön. und Provinzial-Bibliothek	Hanover	Prussia	1901	200,000
116	Stadtbibliothek	Mainz	Hesse	1901	200,000
117	Bibliothèque Sainte-Geneviève	Paris	France	1901	200,000
118	Publičnaja Biblioteka i Sostojaščij pri nej Muzej	Vilna	Russia	1901	200,000
119	Staats Bibliothek	Aarhuus	Denmark	1902	200,000
120	Library of Parliament	Ottawa	Canada	1902	200.000
121	Tomskij Universitet	Tomsk	Siberia	1902	200,000

* Date of latest available statistics.

LIBRARY OF CONGRESS, The (the National Library of the United States). A public institution at Washington, D. C. It was established in 1800, destroyed in 1814 by the burning of the Capitol, afterwards replenished by the purchase by Congress of the library of ex-President Jefferson, but suffered again by a fire in 1851, which reduced it to 20,000 volumes. It has increased rapidly since then (1) through appropriations by Congress; (2) by deposits under the Copyright Law (see Copyright); (3) by gifts and exchanges, particularly of public documents; (4) by the exchanges of the Smithsonian Institution, the library of which (40,000 volumes) was, in 1866, deposited in the Library of Congress with the stipulation that future accessions should follow. The collection has now come to be the largest in the Western Hemisphere and one of the half-dozen largest in the world. It comprised on June 30, 1902, 1,114,111 printed books and pamphlets, 99,532 manuscripts, 64,921 maps and charts, 345,511 pieces of music, and 127,002 prints. It is rich in history, political and social science, public documents, and in Americana, including important files of American newspapers and original manuscripts (due in part to the acquisition of the Peter Force, the de Rochambeau, and other special collections); but it is now a library general in scope, and its purchases include material in every department of literature. From 1800 to 1897 it remained at the Capitol; in 1897 it was removed to the building erected for it under acts of Congress, at a cost of $6,347,000, exclusive of the land, which cost $585,000. The building occupies three and three-quarters acres upon a site ten acres in extent at a distance of 1270 feet east of the Capitol, and is the largest and most magnificent library building in the world. It has a floor space of nearly eight acres; book-stacks which contain about forty-five miles of shelving and space for 2,200,000 octavo volumes, able to be so extended as to accomodate over 4,000,000 volumes; and provision for nearly a thousand readers at a time. The structure, Italian Renaissance in style, is quadrangular, measuring 470 feet by 340 feet, and incloses four courts and a central rotunda. Its numerous works of art are imposing but very unequal in merit. Its organization is now highly elaborate, including besides the general administration various divisions: Order, Catalogue, Reading Rooms, Bibliography, Documents, Manuscripts, Maps, Music, Periodicals, Prints; the Law Library, which still remains at the Capitol; and the Copyright Office; also a branch bindery and printing-office which are branches of the Government Printing Office. The total force employed in the library numbers over 400. The Librarian of Congress is appointed by the President of the United States. He appoints his subordinates and otherwise administers the appropriations granted for the Library and Copyright Office. There is also a Superintendent of the Building and Grounds, similarly appointed. Annual appropriations are granted by Congress upon application of these two officials. For the year 1903–04 they amounted to $583,845, including $100,000 for the increase of the library, but excluding $185,000 for printing and binding. The library is open from 9 A.M. to 10 P.M. on every week-day, and from 2 P.M. until 10 P.M. on Sundays and most holidays. Established for the use of Congress, and still especially serving Congress, the library is now also a public library, national in scope and function. For reference it is freely accessible without formality; but the privilege of drawing books for home use is at present in general limited to members of Congress and certain other classes. Besides its direct service to readers, equivalent in volume to that of any American library, and to Congress and the executive and scientific bureaus at Washington, the



THE LIBRARY OF CONGRESS
WASHINGTON

library gives much bibliographic information by mail and through its publications, which, including its annual reports and reference lists, are distributed freely to institutions and serious investigators. It issues no general catalogue in book form. Its printed catalogue cards are, however, placed for reference at certain centres of research outside of Washington, and are supplied at cost to subscribing libraries. It is thus becoming a central bureau for the cataloguing of all current copyrighted publications and of most others, current and non-current, that are of concern to American libraries.

The organization, history, and operations of the library are described in various of its publications, particularly the Librarian's Report for 1901. The building is most fully described in Small, *Handbook of the Library of Congress* (Boston, 1901).

LIBRA'TION (Lat. *libratio*, a balancing, from *librare*, to poise, from *libra*, balance). A term applied to certain phenomena of the moon's motion. The moon's librations (or, more properly, *apparent* librations) are of three kinds—libration *in longitude*, libration *in latitude*, and the *diurnal* libration. If the moon's rotation in the orbit were uniform, as her rotation on the axis is, we should always see exactly the same portion of her surface; but as this is not the case, there are two small strips of surface running from pole to pole, on the east and west sides, which become alternately visible; this is called the moon's longitudinal libration. The libration in latitude arises from the moon's axis not being perpendicular to her orbit, in consequence of which a portion of her surface round the north pole is visible during one-half, and a corresponding portion round the south pole during the other half of her revolution in her orbit. The diurnal libration hardly deserves the name, and is simply a consequence of the observer's position on the surface of the earth, and not at the centre; it consists in the gradual disappearance of certain points on one edge of the moon's disk as she approaches her culmination, and the appearance of new points on her opposite border as she descends. The combined effect of all three librations is that we can see altogether 59 per cent. of the moon's surface; whereas without the librations we should see only 50 per cent., or one-half. The first and third of these librations were discovered by Galileo, and the second by Hevelius.

LIBRETTO, lē-brĕt'tō (It., little book). The book or text of any extended vocal composition, notably an oratorio or opera. As the Italian opera degenerated the libretto became more and more trivial. During the latter half of the eighteenth and the first half of the nineteenth century the text was of so little importance that the same libretto would be retouched or slightly altered and set to music by many different composers. Serious composers always had difficulty with librettists. Beethoven for a long time wished to write operas, but after his experience with *Fidelio* abandoned dramatic composition forever, because he could not find a suitable text. Wagner began his reforms by insisting upon a good text. But, being a poet himself, he was not dependent upon others. The texts of his earlier works (to *Lohengrin* inclusive) are libretti in the true sense, being divided into arias, choruses, duets, quartets, etc. But they possess literary merit because of the logical and artistic development of the plot and the beauty and force of the language. It would be wrong to apply the term libretto to the text of Wagner's later works. They are *dramas* in the true sense of the word. The influence exerted by Wagner upon librettists has been so strong that, as a rule, modern serious libretti possess some literary merit.

LIBREVILLE, lē'br'-vēl'. The capital of French Congo, West Africa, situated on the coast at the estuary of the Gabun (Map: Africa, E 4). It is an important seaport and coaling-station. The population consists of about 5000 natives and over 200 Europeans.

LIBRI-CARRUCCI, lē'brē kȧ-rōō'chē, GUGLIELMO, Count (1803-69). A French mathematician. He was born at Florence, and was educated at Pisa, where he was professor of mathematics until 1830, when he went to Paris as a political refugee. He was naturalized in 1833; became professor of analysis at the Sorbonne; and succeeded Legendre in the Academy of Sciences. He was promoted to be inspector-general of the University and of the public libraries of Paris. In 1848 he was accused of stealing valuable books and manuscripts under his charge; in 1850, after his escape to England, he was found guilty, and was sentenced to ten years' imprisonment. Among his really important works in mathematics and physics are contributions to Crelle's *Journal* (1835), and the *Histoire des sciences mathématiques* (1838-41 and 1865).

LIBRO D'ORO, lē'brō dō'rō (It., Golden Book). A book in which was inscribed, originally in letters of gold, a roll of all members of the nobility of Venice. All persons twenty-five years of age whose names were there registered were members of the Grand Council. The Golden Book of Venice was burned by Napoleon in 1797. Similar registers were kept in other Italian republics, and the term came to mean in general any list of honors.

LIBUR'NIA (Lat., from Gk. *Λιβουρνία*, *Libournia*). In ancient geography, a mountainous district of Illyricum, on the Adriatic coast, now a part of Croatia and Dalmatia. From early times the Liburni were daring seamen, and were in the possession of Corcyra, Issa, and other islands when the Greeks occupied these places. They were noted pirates, and their privateers, with large lateen sails, were for centuries the terror of the seas. The galleys of the Liburni were noted for their light construction and swiftness, and the Romans, adopting this style of naval architecture, called all fast-sailing vessels *naves Liburnæ*. By means of these light galleys Augustus gained the battle of Actium. The only important towns in Liburnia were Iader and Scardona.

LIBYA, lĭb'ĭ-ȧ (Lat., from Gk. *Λιβύη*, *Libyē*). The name given by the oldest geographers to the whole continent of Africa. In the Roman period the name Africa was generally used for the continent as a whole, while the name Libya was applied specifically to what is now known as the Libyan Desert, together with the strip of land just north thereof, lying along the coast. See AFRICA.

LIBYAN, lĭb'yan (*Luba*, *Levata*, Egypt. *Lebu*, Gk. *Λίβυες*, *Libyes*). A branch of the Hamitic stock, or linguistic family, occupying from most ancient times the north of Africa between the Barcan Desert and the Atlantic Ocean.

They include in Morocco *Amazirg* (Berbers), *Rifians*, and *Shelhas* (Shluhs); in Senegal, *Senagas;* in the Desert, *Tuaregs* and *Tibbus;* in Algeria, *Kabyles, Shawia*, and *Beni-Mzab* (Mzabites); in Tripolitana, *Zouaves* and *Jebel*, and *Ghadames*, southward.

The Libyan people are of medium stature (5 feet 7 inches) and in build are spare, but strong. They are fair-skinned, and much lighter than the average fellah of the Nile or than the Arabs. Dark hair and hazel eyes are more frequent than light hair and blue eyes, though in all villages persons resembling the North German type are to be seen. It is interesting to note how this mark has persisted. On the walls of the tomb of Seti I. and Merenptah (B.C. 1300), at Thebes, are shown four types, representing the Egyptian, the Asiatic, the Negro, and the Libyan. The Egyptians are painted red, but the Libyans are white, with blue eyes and fair beards, preserved until this day in the blond Berber, from Tripoli to Tangier and far into the desert.

The home of the Libyans is for the most part a mountainous region, here and there lifted above the snow-line and flanked by a Piedmont on north and south, the former sloping into the Mediterranean, the latter toward the Sahara.

As distinguished from the nomadic and predatory Arabs, the Libyans are and have been partly agricultural, partly industrial, and partly commercial. The difficult traffic across the Sahara into the Negro Sudan has been theirs from time immemorial. For the prosecution of this commerce horses, camels, and asses were needed, and the rearing of these gave variety to their activities. Agriculture has always been their congenial pursuit. In the narrow valleys terraced gardens are common, but in the wider, more open spaces the plow takes the place of the hoe and the implements seem not to have changed their form in many hundreds of years. The Libyans possess little mechanical skill, as is evidenced by their mills, looms, and metallurgy. Pottery is made by hand, without the wheel, by modeling or building up by coils, and burnt in little kilns in the open air. In some tribes, the Kabyles (q.v.), for example, the forms and decorations remind the student of the most ancient ceramics of Egypt.

The dress of the Libyans of to-day is for the men a cotton or woolen undergarment and over this a burnoose, consisting of blankets sewed together and having a capuchin hood attached. Sandals with soles of plaited grass complete the costume. To this a cäida (*Kaid*) will add a scarf, loose tunic, sleeved waistcoats, embroidered waistcoats, a girdle, and a turban, besides a rosary, boots or stockings of red leather, and large black shoes.

The women wear a single tunic of coarse material, with holes for the arms, tied up at the waist with a girdle. A profusion of silver ornaments is common, and finer garments with gay headdress are worn on festive occasions.

The unit of Libyan social life is the monogamous family, in which the women do not go veiled, but custom lays on them many restrictions. The unit of political life is the village community, with purely democratic government, unless outside influences have prevented, as among the Tuaregs. The presiding officer of the general assembly has no power of initiative, but is the servant of the village. Villages are united into tribes, for geographic and economic reasons, and these in great emergencies unite in confederacies. Beneath this democratic system and modifying its action exist secret societies or organizations which are sworn to protect their members in every difficulty. Excepting on the rarest occasions the Libyans have never developed a national spirit.

The Libyans or Berbers have been Mohammedans since the seventh century. Herodotus says that the Libyan nomads sacrificed to the sun. Egyptian, Greek, and Roman polytheisms, singularly enough, made little impression on them. Beyond nature-worship and the wearing of charms they were almost without a cult. Consult Randall-Maciver and Wilkin, *Libyan Notes* (London, 1901). See BERBER, and the various Libyan tribes under their special designations.

LIB'YAN DESERT (Lat. *Libyæ deserta*). That part of the African continent lying between Egypt and Fezzan, and extending from the Mediterranean to Darfur. It contains a number of oases, or fertile tracts, islands of verdure in the vast sands, which support a sparse population; but the surface generally consists of irreclaimable sandy or gravelly plains, separated by low rocky ridges, or shelving down in a series of terraces toward the Mediterranean. See LIBYA.

LIBYAN SEA (Lat. *Mare Libycum*). The name given in ancient geography to that part of the Mediterranean which lies between the island of Crete and the coast of Africa.

LICATA, lê-kä'tȧ, or **ALICATA**. The most important city commercially on the south coast of Sicily, at the mouth of Salso, in the Province of Girgenti, 137 miles by rail southeast of Palermo (Map: Italy, H 10). It is beautifully situated on the lower slopes of the hill of Sant' Angelo. The harbor of Licata promises before long to be one of the best in Sicily. The principal export is sulphur. The country produces grain, wine, olives, fruit, cheese, wool, hides, and cotton, and the sea yields anchovies and sardines. Here in B.C. 256 Regulus (q.v.) vanquished the Carthaginians in the naval battle of Ecnomus, and in 249 Carthalo, favored by a storm, destroyed a fleet of Roman transports. Population, in 1881 (commune), 17,478; in 1901, 22,031.

LI'CENSE (OF., Fr. *licence*, It. *licenza*, from Lat. *licentia*, license, from *licere*, to be permitted). In music, the liberty which a composer takes in deviating from the rules of his art, and which is often marked with the words *con licenza* in order to indicate that it has been introduced intentionally to produce some unusual effect. Many licenses occur, however, in the works of great composers like Mendelssohn, Bach, and Haydn, where the notice *con licenza* is omitted, but it will generally be found that they are introduced for the purpose of characterization. Especially in dramatic music much license is permitted in order to obtain characteristic expression, such as leading voices in open fifths, or doubling intervals, that ought not to be doubled according to the rules of strict writing.

LICENSE. In general, an authority given by one person to another to do certain acts which but for such authority would be unlawful. Specifically, the term includes licenses by a landowner to come upon or otherwise use his land and licenses by municipal or other authority to ply certain trades or callings.

Licenses of the former sort are either *executory*, where the act authorized has not been done, or *executed*, where it has been done. At law all such licenses may be revoked by the grantor, unless the license be coupled with an interest in the land, and the same rule prevails in equity courts, except that the latter sometimes hold that an executed license, where the license was based on a consideration, is not revocable at the pleasure of the grantor. A court of equity regards such an executed license as an executed contract, one of the parties to which, the licensee, has gone too far to be put back into his former position. A license, though revoked, saves the licensee harmless from liability or responsibility for such acts as he has done thereunder. A license in regard to land is not to be confused with an easement (q.v.). An executed license which puts an end to an easement of the grantor in the licensee's land is irrevocable.

The most common licenses of the second sort are licenses to sell liquor, to exercise the trade or calling of a peddler, to give theatrical or other public entertainments, to hold public meetings, to use the streets for processions, etc. Such acts are in themselves innocuous and do not constitute a violation of the common law, but are generally restricted by statute or by local municipal ordinances in the interests of public order and safety. Such licenses are a matter of statutory regulation.

The term license is used in international law for the authority given by a State engaged in war to its subjects or the subjects of the State with which it is at war, to engage in a trade forbidden in time of war. The right to give such licenses is original with the sovereign power, and they may be given by commanding officers in the army or navy as its delegates. A license in *patent law* is a permission to make or sell a patented article.

LICEN'TIATE (ML. *licentiatus*, p.p. of *licentiare*, to license, from Lat. *licentia*, license). A university degree between that of bachelor and doctor, or one holding that degree. It is used somewhat in Europe to indicate a person who has taken certain examinations and is licensed to lecture.

LICHAS, lī'kas (Neo-Lat., from Gk. λιχάς, space between the thumb and forefinger). An interesting genus of fossil trilobites found in rocks of Ordovician, Silurian, and Devonian age. The genus is characterized by broad flat carapaces, short wide head, small eyes, and peculiar lobation of the central portion of the head-shield. The genus has several allies that have the most extravagant spinose ornamentation. One of the simpler forms, Lichas bigsbyi, is a well-known characteristic index fossil of the Niagara group. See TRILOBITA.

LICHEN, lī'kĕn (Lat. *lichen*, from Gk. λειχήν, *leichēn*, λιχήν, *lichēn*, tree-moss, ringworm; possibly connected with λείχειν, *leichein*, Skt. *rih*, *lih*, OChurch Slav. *lizati*, Lat. *lingere*, to lick, OIr. *ligim*, I lick, OHG. *leokōn*, Ger. *lecken*, AS. *liccian*, Eng. *lick*). A dry, papular disease of the skin. Formerly there existed considerable confusion in the use of the term; but since the time of Hebra, the Vienna master, it has been limited to (1) *lichen scrofulosum* and (2) *lichen ruber*. The former has now been definitely classed among the cutaneous tuberculoses, leaving *lichen ruber* as the only affection regarded by dermatologists as entitled to the name. In most cases, especially in neurotic subjects, there is much itching, which provokes destructive scratching. The disease is an affection of nervous origin, following sorrow or violent nervous emotions, and is often accompanied by insomnia, agitation, and headache. Hot sedative douches, arsenic, and proper diet and hygiene produce good results, aided by external application of carbolic acid, pilocarpine, mercury, lead, chrysarobin, and the curette. Consult Kaposi, *Pathology and Treatment of the Diseases of the Skin* (New York, 1895).

LICHENIN, lī'kĕn-ĭn. A starch-like body, found in Iceland moss and other lichens, from which it is extracted by digesting the moss in a cold, weak solution of carbonate of soda for some time, and then boiling. By this process the lichenin is dissolved and on cooling separates as a colorless jelly. Iodine imparts no color to it.

LICHENS, lī'kĕnz (Lat. *lichen*, from Gk. λειχήν, *leichēn*, λιχήν, *lichēn*, lichen). A very large group of plants, mostly northern and arctic in their distribution, some of the forms living at the very limits of vegetation. They have generally flat, membranous, or crustaceous bodies, but some forms have branching stalks. Lichens are exceedingly interesting in their structure and life activities, for they are known to be composed of two plants living together (smybiosis, q.v.). Every lichen is made up of two elements: (1) colorless threads (filaments); and (2) cells (gonidia) containing green or blue-green pigment. These latter are blue-green (Cyanophyceæ) or green algæ (Chlorophyceæ), and the colorless thready portion is a fungus. The fruit of a lichen is that of an ascomycete fungus, generally a flattened or cup-shaped structure with variously colored lining (black, brown, red, etc.). The colored lining of the cup or disk consists chiefly of the little sacs (asci) which contain the spores. There is a small group of tropical lichens whose fungus constituent is related to the mushrooms (Basidiomycetes). Lichens generally live in exposed situations, where their only source of water is that from rain and fog. This water is used by the algal cells which manufacture organic food in the manner characteristic of all green plants (photosynthesis, q.v.). When the lichen dries up in the sunshine all vegetative activities cease for the time, to be resumed when the plants are again moistened. However, lichens are especially adapted to retain moisture by the gelatinous character of the thallus. There are also present thread-like outgrowths (rhizines) from the fungal part of the plant, which may draw up some water from the substratum, but probably serve chiefly as organs of attachment. The algal portion of a lichen manufactures the organic food that is absorbed by the fungal elements, which bear the same relation to the algal cells as does any parasitic fungus to its host. The fungal portion makes no return at all commensurate with the benefits it receives; indeed, it is well known that the fungus may injure and even destroy the alga. The algæ are really slaves of the fungi, and under such conditions the latter are absolutely dependent upon the former. The algæ are of course perfectly able to take care of themselves, and do actually grow wild on many of the surfaces frequented by lichens. Some of the lichens are conspicuous in the landscape, e.g. many forms in barren highlands among the mountains, and on the rocky shores in the Arctic regions. The lichen called 'reindeer moss' (*Cladonia rangiferino*) supports immense herds of reindeer and cattle in the highlands of Norway, and the 'Iceland moss' (*Cetraria islandica*) is eaten by man. Some typical lichens are shown on the accompanying plate.

A lichen-spore can produce a new plant only if it germinates among the cells of a suitable alga. It then proceeds to inclose the algal cells in a web of threads (mycelium) and holds them ever afterwards in slavery. This behavior has been well established by a number of investigators who have produced artificial lichens by bringing the spores in contact with the proper wild algæ. Groups of algal cells with a portion of the thready body (mycelium) may form scales ('soredia') on the surface of the lichen body, and these are capable of reproduction.

For American species, consult Tuckerman, *A Synopsis of North American Lichens*. See Ascomycetes and Colored Plate of Mosses and Lichens with Musci.

LICH'FIELD. An ancient city in Staffordshire, England, a civic county, 15 miles southeast of Stafford (Map: England, E 4). Considerable brewing is carried on, together with market gardening and manufacturing of harness, carriages, and carpets. Its chief edifice is the cathedral, a red sandstone building of fine proportions in the early English style, dating from the thirteenth and fourteenth centuries, and occupying a commanding site. Its length is 403 feet; width of transepts, 149 feet; of nave, 65 feet; and height, 60 feet. It is surmounted by three spires, the central spire being 260 feet high, and the two western spires each 190 feet high. Other notable features are the western façade, ornamented with one hundred statues in niches; the triforium, the Lady Chapel, and several fine monuments. The cathedral, formerly surrounded by a wall, was besieged and damaged greatly by the Puritans in 1643. It was restored by Wren, who built the central spire; at the end of the nineteenth century it again underwent a complete restoration. Lichfield has a free grammar-school, in which Addison, Ashmole Johnson, and Garrick, natives of the town or vicinty, were educated. The market-place contains a colossal statue of Dr. Johnson. Lichfield was made an episcopal see in 669, and received its city charter in 1549. Population, in 1891, 7864; in 1901, 7900. Consult: Britton, *History of Lichfield* (London, 1836); Beresford, *Lichfield* (London, 1880).

LICH-GATE (from *lich*, AS. *līc*, OHG. *līh*, Ger. *Leiche*, Goth. *leik*, corpse, body + *gate*), or Corpse-Gate. A churchyard gate with a porch or shed attached. Such gates are common in many parts of England. The bodies of persons brought for burial are set down under the shelter of the roof while the service is read.

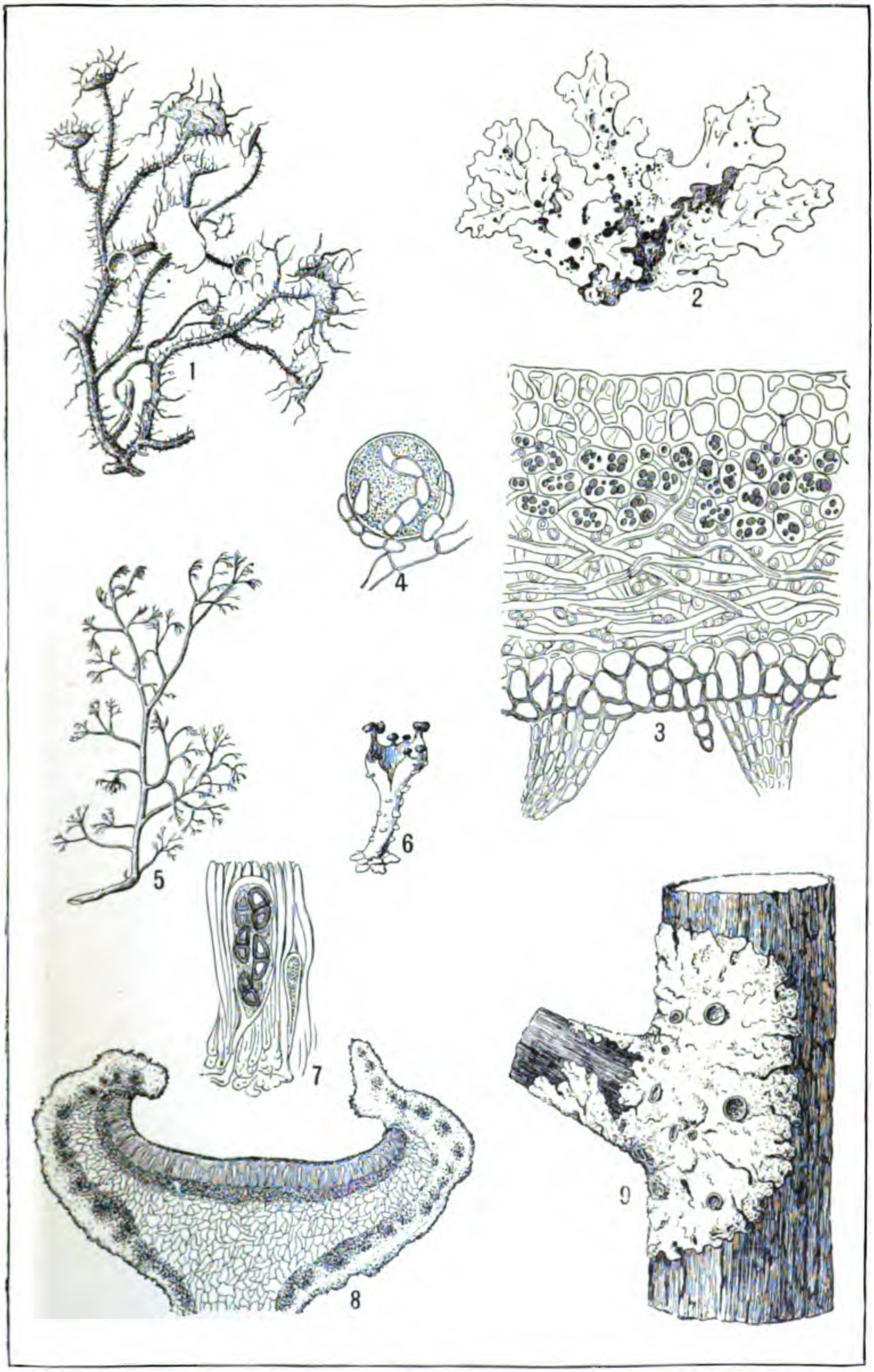
LICHTENBERG, lĭᴋ'ten-bĕrᴋ. A residential suburb of Berlin, on the east, practically a part of the capital. Population, in 1890, 22,770; in 1900, 43,372.

LICHTENBERG, Georg Christoph (1742-99). A German physicist and satirist, born at Oberramstadt, Grand Duchy of Hesse. He received his first instruction in mathematics and physical studies from his father, and after studying at Göttingen was appointed professor in the University of Göttingen in 1769. At the end of that year he went to England, where he mingled and studied with many of the leading scientists of his day. The results of his investigations appeared later in numerous discoveries in the field of electricity, of which the most important were the electrical figures named after him. In England he became a frequent visitor to, and student of, the theatre in which Garrick was then a distinguished figure. Moreover, a keen observer by nature and training, in his study of English literature he was soon impressed by the inferiority of the German wit to that of such men as Swift, after whom he later patterned to some extent his own satiric method. After a second visit to England (1774-75), he resumed his lectures on experimental physics at Göttingen. He continued, however, to devote much time to literary pursuits. His keenness of wit and his boundless resources of ridicule resulted in his publication of several well-aimed satires, of which the best known are his *Ueber Physiognomik wider die Physiognomen*, against the new science of physiognomy of Lavater, and his *Ueber die Pronunciation der Schöpse des alten Griechenland*, against Voss. From 1778 he edited the *Göttingischer Taschenkalender*, in which he severely attacked the 'Storm and Stress' writers. Here he published in part his articles on Hogarth, whom he did much to popularize in Germany. In the completed work, the *Erklärung der Hogarthischen Kupferstiche* (1794 et seq.), he gave the most brilliant proof of his critical power, by his clear explanation and interpretation of the English artist's work. In later years he was affected by hypochondria, but, though forced to withdraw from society, continued his studies and writings. His *Gedenkbücher*, or Diaries, contain interesting maxims, epigrams, and brief essays. Consult Lauchert, *Lichtenbergs schriftstellerische Thätigkeit* (Göttingen, 1893).

LICHTENBERG, Leopold (1861—). An American violinist, born in San Francisco. He first appeared in public when eight years of age. Four years later he came under the tuition of Wieniawski, and toured with him through the various States of the Union. Subsequently he was for six months under Lambert in Paris, after which he rejoined Wieniawski in Brussels; and, devoting himself for three years to serious study, he was enabled to win a first prize at the national 'concours.' He returned to America, and for a time played under Theodore Thomas in New York, after which he made a three years' tour of Europe. Returning to America, he became a member of the Boston Symphony Orchestra, and was appointed head of the violin faculty of the New York Conservatory.

LICHTENBERGER, lĭᴋ'ten-bĕr-gẽr, Frédéric Auguste (1832—). A French theologian, born at Strassburg. He obtained his degree in theology, and was made professor at the university of his native town (1864). In 1877 he was appointed professor in the newly founded Protestant faculty at Paris, of which he also became dean. His publications include: *La théologie de Lessing* (1854); *De Apostolorum Præceptis Redemptoriam Christi Mortem Spectantibus* (1857); *Etude sur le principe du protestantisme* (1857): *Des éléments constitutifs de la science dogmatique* (1869); and *Histoire des idées religieuses en Allemagne depuis le milieu du XVIIIème siècle* (1873-87).

LICHENS



1. USNEA.
2. STICTA.
3. SECTION OF STICTA, showing algal cells surrounded by fungal filaments.
4. AN ALGAL CELL with investing fungal filaments, from Cladonia.
5. CLADONIA, the "Reindeer Moss".
6. THE SPORE-BEARING PORTION OF CLADONIA.
7. AN ASCUS with two-celled spores, from Fig. 8.
8. SECTION OF "FRUIT", from Anaptychia.
9. PHYSCIA.

LICHTENSTEIN, lĭK′ten-stīn, Martin Heinrich Karl (1780-1857). A German traveler and zoölogist, born at Hamburg, and educated at Jena and Helmstedt. He went as physician and tutor with the Dutch General Janssens to South Africa (1801), and served as surgeon to an infantry battalion of Hottentots and as governmental commissioner to the Bechuanas. In 1806, on the occupation of the colony by the English, he returned to Germany, devoting himself to the study and classification of the zoölogical and especially ornithological material he had collected in Africa. In 1811 he was made professor of zoölogy at Berlin, and two years afterwards was appointed to succeed Illiger as director of the Zoölogical Museum. His more important publications were *Reisen im südlichen Afrika* (1810-11) and *Darstellungen neuer oder wenig bekannter Säugetiere* (1827-34).

LICHTENSTEIN, Ulrich von. See Ulrich von Lichtenstein.

LICHTWER, lĭKt′vĕr, Magnus Gottfried (1719-83). A German fabulist. He was born at Wurzen, studied law at Leipzig and Wittenberg, and was subsequently Canon of Saint Mauritius. His chief work is to be found in the *Vier Bücher Aesopischer Fabeln* (1748). There is a collection of *Schriften* (1828) edited by Von Pott and Cramer.

LICIN′IAN ROGATIONS (Lat. *rogationes Liciniæ*, from *rogare*, to ask). A rogation was the term for a bill proposed by a Roman magistrate for incorporation in the laws of the State. In B.C. 367, after a struggle of almost ten years, the tribunes Licinius Stolo and Lucius Sextius secured the adoption of a law that put an end to the long strife between patricians and plebeians. It provided (1) that the office of consular tribune should be abolished, and that one of the two consuls should be a plebeian; (2) that no one should hold more than 500 *iugera* (about 250 acres) of the public land; (3) that no one should pasture more than 100 cattle or 500 sheep or goats upon the public lands; and (4) the easy payment of accumulated debts. The first plebeian consul under the new law was Lucius Sextius himself.

LIC′INIA′NUS, Granius. A Roman historian. See Granius Licinianus.

LICINIO, lē-chē′nē-ō, Bernardino da Pordenone. An Italian portrait and religious painter of the Venetian school. The dates of his birth and death are unknown, but his pictures are dated 1524-42. He was born at Pordenone, and is related to the great Pordenone (q.v.). He is chiefly known as having been one of the first to paint, if not the inventor of, family portrait groups. Several of his family pieces survive, all representing the artist, surrounded by his family and pupils, of which good examples are in the Borghese Gallery, Rome, and at Hampton Court. Good examples of his single portraits are in the galleries of Bergamo, Dresden, and Budapest. He also painted religious pieces, of which the best is a "Madonna Enthroned," in the Church of the Frari, Venice; others are in the Sciarra and Doria galleries, Rome, the Palazza Balbi, Genoa, and the Hermitage, Saint Petersburg.

LICIN′IUS, Caius Flavius Valerius (c.270-324). A Roman Emperor. A Dacian by birth, he entered the Roman Army and rose to high command. The Emperor Galerius, a comrade in old campaigns, made him Augustus (307), after the death of Severus, with control of Pannonia and the Alpine district. Galerius died in 311, and Licinius strengthened himself in the West by marrying the sister of Constantine, and by concurring in the Western Emperor's edict of toleration to the Christians. By his defeat of Maximinus at Adrianople, Licinius became sole Eastern Emperor. But he soon quarreled with Constantine, and after his first defeat near Cibalis (314) gave up to him his European domain except Thrace and a port of Mœsia. Having taken up arms again and been defeated a second time by the Western Emperor at Adrianople and Chrysopolis (323), he surrendered and was executed for treason in spite of promises that his life would be spared.

LICK, James (1796-1876). An American philanthropist, born in Fredericksburg, Pa. He learned the trade of a pianoforte manufacturer, and followed the business in Philadelphia, Buenos Ayres, Valparaiso, and other places. In 1847 he settled in California, where he invested in real estate. The profits on this investment were very large, and in 1874 he placed $3,000,000 in the hands of seven trustees, to be devoted to certain specified public and charitable uses. He twice appointed a new board of trustees. Lick's principal bequests were: To the University of California for the erection of an observatory, and procuring therefor a telescope superior to and more powerful than any before constructed, $700,000; to found an old ladies' home in San Francisco, $100,000; for the erection and maintenance in San Francisco of free public baths, $150,000; for the erection of three groups of bronze statuary, representing three periods in the history of California, to be placed before the city hall of San Francisco, $100,000; to erect in Golden Gate Park a bronze monument to Francis Scott Key, $60,000; to found and endow the California School of Mechanic Arts in San Francisco, $540,000. See Lick Observatory.

LICK′ING. A river of Kentucky. It rises in the mountains of Floyd County, in the eastern part of the State, flows northwest 200 miles, and empties into the Ohio opposite Cincinnati (Map: Kentucky, H 2). At high water small steamboats can ascend to Falmouth, a distance of 60 miles.

LICK OBSERVATORY. An astronomical observatory situated on Mount Hamilton, an eminence in the Coast range, California, 4285 feet high, and about 25 miles east of San José. It is reached by a carriage road 20 miles long, but of easy ascent. The observatory, which was completed in 1888, constitutes the astronomical department of the University of California. The advantages gained by this particular situation are an unobstructed view for a radius of 100 miles, and opportunity for observation during the greater part of the year, clear nights occurring regularly for six or seven months. The great telescope is the second largest refracting telescope in the world, the objective having a clear aperture of 36 inches, and being surpassed only by the 40-inch telescope at the Yerkes Observatory (q.v.) near Chicago. It has a focal length of 56 feet 2 inches, and the cast-iron column on which it rests has a dimension at the base of 17 feet north and south, and of 10 feet east and west. The point of suspension of the telescope tube is 36 feet from the floor. The dome, which has an exterior diameter of 76 feet, is moved by water-power, as is the observation platform. A smaller dome contains a 12-inch telescope. In front is a piazza, and on the back a plain of about 100 yards in extent has been made by blasting off a peak of the mountain. Upon this a great meridian circle, made by the Repsolds, is mounted; also a transit instrument, a photoheliograph, and a three-foot reflecting telescope, that formerly belonged to Crossley of England. A lens for photography has been so arranged that it can be attached to the end of the big telescope. The entire fund for the construction of this observatory was given by James Lick. See LICK, JAMES.

LICORICE, or **LIQUORICE** (OF. *licorice*, from Lat. *liquiritia*, corrupted from *glycyrrhiza*, Gk. γλυκύρριζα, *glykyrrhiza*, licorice-plant, from γλυκύς, *glykys*, sweet, + ῥίζα, *rhiza*, root), *Glycyrrhiza*. A genus of perennial herbs of the natural order Leguminosæ, the members of which have long, pliant, sweet roots, and generally creeping rootstocks; odd-pinnate leaves of many leaflets; flowers in spikes, racemes, or heads. The roots are valuable because of a yellow transparent, uncrystallizable substance called glycyrrhizin, allied to sugar, soluble in both water and alcohol, and forming compounds with both acids and bases, and used in medicine. The common licorice (*Glycyrrhiza glabra*), native of the south of Europe and of many parts of Asia, has stems three to four feet high, and racemes of whitish violet-colored flowers. It is cultivated in many parts of Europe, chiefly in Spain and Russia. It has been grown to a limited extent in Louisiana and California. The roots are extensively employed by porter-brewers. They are imported into the United States in considerable quantity, and the black concentrated extract of them (black sugar or stick licorice) is largely imported from the south of Europe, in rolls or sticks, packed in bay-leaves. After a plantation has been made, almost three years must elapse before the roots can be dug for use. Licorice requires a deep, rich, loose soil, well manured. The roots penetrate to the depth of more than a yard; straight tap-roots are most esteemed. The plant is propagated by cuttings of the rootstalks, but when once planted the ground will be stocked for many years because the small pieces of root left after digging will grow. The plant is likely to prove a pest upon land suitable to its growth. The roots of the prickly licorice (*Glycyrrhiza echinata*) are used in the same way, chiefly in Italy and Sicily, Russia, and the East.

LICORICE.

LICTOR. The official attendant of a magistrate in ancient Rome. The origin of the name is obscure; ancient writers derive it from *ligare*, 'to bind,' because it was the lictors' duty to bind criminals for execution; but this is improbable, as the proper form would then be *ligator*. More likely is the derivation from *licere*, 'to summon,' as they were detailed to summon the voters to the *comitia curiata*. In kingly Rome the lictors were twelve in number, and served as personal attendants of the King. Under the Republic the consul had twelve, the dictators twenty-four, the *magister equitum* six, and the prætor two. In the provinces, the proconsul was allowed twelve and the propraetor six. During the first century of the Empire the Emperor was attended by twelve lictors; but Domitian increased the number to twenty-four, and afterwards the office was wholly abolished. Besides those attached to the persons of the civil magistrates, other lictors were assigned to the high religious functionaries. The chief priest (*pontifex maximus*) had twelve, the priest of Jupiter (*flamen Dialis*) six; and when a vestal virgin went through the streets she was accompanied by a single lictor. During the Republic the lictors were men of plebeian rank, under the Empire largely freedmen. They wore the toga, and walked in single file before the magistrate, each bearing on his left shoulder the *fasces*, or bundle of rods tied about an axe, as a symbol of authority. Their duty was to clear the road for the magistrate, see that his authority was respected, and, in general, execute his orders.

LID'DELL, HENRY GEORGE (1811-98). An English classical scholar. He studied at Charterhouse School, then at Christ Church, Oxford, from which he was graduated in 1833 with highest honors. He was head-master of Westminster School from 1846 to 1855, and in 1862 became chaplain extraordinary to the Queen. In 1855 he was made Dean of Christ Church, and was vice-chancellor from 1870 to 1874. He wrote a ***History of Rome from the Earliest Times to the Establishment of the Empire*** (1855), but he is best known as the author, together with Dean Scott, of the standard *Greek Lexicon* (1843, 8th ed. 1897), based on Passow's work.

LID'DON, HENRY PARRY (1829-90). An English clergyman, generally acknowledged to have been the greatest pulpit orator of his time in the Church of England. He was born at North Stoneham, Hampshire, and educated at King's College School, London, and Christ Church, Oxford, where he took his degree in 1850. He was ordained deacon in 1852 and priest in 1853, proceeding to his first pastoral work at Wantage. In 1854 he was chosen to be the first vice-principal of Bishop Wilberforce's new theological college at Cuddesdon; but the pronounced Church views which he had imbibed at Oxford from association with Pusey and Keble, his intimate friends through life, led to his resignation in 1859. He then became vice-principal of Saint Edmund's Hall, and exercised a great and growing influence in university affairs. In 1870 he was appointed Ireland professor of exegesis, but resigned his chair in 1882 and took thereafter no active part in Oxford affairs, regarding the changes made by the Universities Commission as a repudiation of religious influence. From 1870 until his death he was a canon of Saint Paul's, London, and here exercised his widest influence. His sermons recalled the traditions of the best days of French preaching. He took a leading part in numerous important movements, in opposition to the Public Worship Regulation Act, in defense of the Athanasian Creed, in the foundation at Oxford of Keble College and the Pusey House, and in censure of what he considered the dangerous teachings of *Lux Mundi* (see Gore, Charles). At the time of his death he was engaged in the preparation of an elaborate life of Dr. Pusey, and had three volumes practically completed; it was afterwards edited for publication by Johnston and Wilson (2d ed., 4 vols., London, 1893-97). He was elected Bishop of Edinburgh in 1886, but did not accept. His published works consist largely of sermons, of which the most important are his Bampton Lectures *On the Divinity of Our Lord and Saviour Jesus Christ* (1866). Consult Donaldson, *Five Great Oxford Leaders* (London, 1900).

LIDNER, lēd'nĕr, Bengt (1757-93). A Swedish poet, born at Göteborg. When he went to the University of Lund (1774) he became the head of a coterie of youthful poets. Already dissipated, he had to leave the university at the end of a year, and took his degree at Rostock. At Stockholm he published a collection of fables that attracted the attention of the King, Gustavus III., who sent him to Paris as secretary of the Ambassador, Creutz. While there he wrote his tragedy, *Erik XIV*. His most remarkable poems are *Grefvinnan Spostaras Död* and *Aret 1783*, and *Medea*, a tragedy. His complete works were published in 1788, and again, with a biography by Sander, in 1859.

LIDO, lē'dō. A range of low islands separating the lagune of Venice from the Adriatic. At the northern end lies the port of Venice, also called Lido.

LIE, lē, Jonas Lauritz Edemil (1833—). A Norwegian novelist, born at Eker, June 11, 1833. He studied at Christiania, where he associated with Björnson and Ibsen, at first practiced law, and then gave himself to literature, journalism, and teaching. His first novel, *The Visionary* (1870; trans. 1894), was warmly received and the Norwegian Government accorded him a traveling stipend. He went to the far North and to Rome, where he wrote *Tales and Sketches from Norway* (1872). His knowledge of the sea and coast life gave a peculiar flavor to *The Bark 'Future'* (1873, trans. 1879), and *The Pilot and His Wife* (1874), the latter his most widely known novel. He received from the Government the Poet's Pension, and in the main lived abroad in German cities and in Paris, producing some score of good novels and two mediocre comedies. In the novels, *The Slave for Life* (1883) marks a turning-point. His earlier work—*Thomas Ross* (1878), *Adam Schrader* (1879), both urban; *Rutland* (1881), *Press On* (1882), both sea-tales—is poetic and sympathetic. From 1883 onward—*The Family at Gilje* (1893), *A Maelstrom* (1884), *Eight Stories* (1885), *The Daughters of the Commodore* (1886), *Married Life* (1887), *Evil Powers* (1890), *Troll I. and II.* (1891-92), *Niobe* (1893), *Maisa Jons* (1900)—Lie falls under the domination of the French Naturalistic School. In seeking to be more true to real life he fixes his eyes on its less pleasant aspects, but sympathy and humor never desert him when he writes of the sea. Many of Lie's stories have been translated into English, German, and other languages. Lie's return to Norway in 1893 after twelve years' absence was celebrated as a national festival.

LIE, Sophus (1842-99). A Norwegian mathematician, born at Nordfjord, near Bergen. He studied at Christiania and, on receiving a traveling scholarship in 1869, visited Germany, Italy, and France. In the following year he began teaching at Christiania. He received his doctor's degree in 1871, presenting a remarkable thesis, "On a Class of Geometric Transformations." From 1872 to 1886 he held the chair of mathematics in the University of Christiania, and was then called to Leipzig to succeed Klein. In 1898 he was again called to the University of Christiania, and died there in January of the following year. Lie's greatest work was in the theory of differential equations and in his discovery of continuous transformation groups. His best known works include: *Theorie der Transformationsgruppen* (1888-93); *Vorlesungen über Differentialgleichungen mit bekannten infinitesimalen Transformationen*, and also *Ueber continuierliche Gruppen* (edited by Scheffers, 1891, 1893). For a complete list of his works consult Engel, "Sophus Lie," in *Bibliotheca Mathematica*, ser. 3, vol. i. (Stockholm, 1890); for biography, Engel, in the *Jahresbericht der Deutschen Mathematiker-Vereinigung*, vol. viii. (Berlin, 1900); Darboux, in the *Comptes Rendus de l'Académie des Sciences*, vol. cxxviii. (Paris, 1899); *Bulletin of the American Mathematical Society* (New York, 1899).

LIEBEN, lē'ben. A town in the Crownland of Bohemia, Austria, at the confluence of the Rokytnitzbach and the Moldau (on the right bank of the latter), 2½ miles northeast of Prague. Weaving, spinning, tanning, dyeing, lace-making, and manufactures of machinery, chemicals, cardboard, colors, pipes, and gloves constitute the leading industries of the town. Population, in 1890, 12,536; in 1900, 21,300.

LIEBENSTEIN, lē'ben-stīn. A ruined castle on the Rhine, near Saint Goar, which, with the neighboring Castle of Sterrenberg, is associated with a legend of two brothers estranged through their love for their foster-sister Hildegarde. The castles are hence known as the Two Brothers.

LIEBER, lē'bĕr, Ernst (1838-1902). A German politician, leader of the Clericals. He was born at Camberg, studied law in Würzburg, Munich, Bonn, and Heidelberg, and, after taking a prominent part in the politics of Hesse-Nassau, was chosen to the Prussian House of Deputies in 1870 and to the Reichstag in 1870. He was one of the founders of the Centrum in each of these Houses, and after Windhorst's death succeeded in part to its leadership, opposing in 1893 the efforts of the moderate Clericals to come to an agreement with the Government, but afterwards practically accepting their programme.

LIEBER, Francis (1800-72). A German-American publicist. He was born in Berlin, March 18, 1800. In 1815 Lieber enlisted in the Prussian Army, fought at Ligny and Waterloo, and in the attack on Namur was severely wounded. After Napoleon's overthrow he studied in Berlin, and becoming imbued with liberal political ideas, was, in 1819, accused of plotting against the Government and imprisoned. The charges never came to trial, but on his discharge he was forbidden to study at the Prussian universities. In 1820 he took his degree at Jena. On the outbreak of the Greek revolution in 1821, he went to Greece to take part in the struggle. An account of his experiences is given in his *Journal in Greece* (1823). In 1822 he found his way to Rome, where he became a tutor in the family of the historian Niebuhr. With him Lieber returned to Berlin, and was rearrested on allegations of disloyalty based on the old charges. After a short imprisonment at Köpenick, enlivened by the composition of a number of poems, he was released through the efforts of his friend Niebuhr, and, wearied by this constant persecution, left his native country in 1825 forever. For a short time he resided as a teacher in London, and in 1827 he embarked for the New World. His first work, the editing of the *Encyclopædia Americana,* was completed during his five years' residence in Boston (1827-32). The next two years were spent in Philadelphia, where he was interested in educational plans in connection with Girard College. In 1835 he removed to Columbia, S. C., where he occupied the position of professor of political economy in the South Carolina College for twenty years; and here he produced his most important works: *A Manual of Political Ethics* (1838); *Legal and Political Hermeneutics* (1839); and *Civil Liberty and Self-Government* (1852). In his line of investigation Lieber stands second to none. Such writers and jurists as Wittermaier, Bluntschli, Laboulaye, Story and Kent, recognized in him a kindred mind. The spirit of his work is indicated in his favorite motto, *Nullum jus sine officio, nullum officium sine jure* ("No right without its duties, no duty without its rights"). In 1856 Lieber was called to Columbia College, New York, to take the chair of political economy, and in 1860 accepted the chair of political science in the Columbia Law School, giving up his chair of economics. During the Civil War he served the Government by preparing, at the request of the War Department, a set of "Instructions for the Government of the Armies of the United States in the Field," which is regarded as an authority on the usages of civilized warfare, and forms the basis of a number of military codes to-day. It is known as "General Order No. 100," and is quoted often as authoritative. Lieber was a member of the French Institute and of numerous other learned societies in America and Europe. He died in New York, September 2, 1872. Among his voluminous minor writings the following are the most noteworthy: *Reminiscences of Niebuhr; Laws of Property; Penal Laws and the Penitentiary System; Prison Discipline; The Origin and Development of the First Constituents of Civilization;* and *Great Events Described by Great Historians.* His memoir was written by Perry, published in Boston, 1882, and a discriminating estimate of his career was published by Thayer in 1873. Lieber's *Miscellaneous Writings* were collected by Gilman and published in two octavo volumes, Philadelphia, 1881. His collection of books were sold to the University of California, and his manuscripts were deposited in the Johns Hopkins University.

LIEBER, GUIDO NORMAN (1837—). An American soldier and publicist. He was born at Columbia, S. C., where his father, Francis Lieber (q.v.), was a professor in South Carolina College. He graduated at that institution in 1856, and at Harvard Law School in 1859, and at the outbreak of the Civil War was practicing law in New York City. He then obtained an appointment as a lieutenant in the Regular Army, was assigned to the Eleventh Infantry, was advanced to the rank of regimental adjutant, and served in McClellan's Peninsular campaign, in which he was brevetted captain for gallantry at the battle of Gaines's Mill (June 27, 1862). At the second battle of Bull Run he served as an aide on General Pope's staff. Appointed major and judge-advocate, he was assigned to the Department of the Gulf, receiving a further brevet for services in the Red River campaign. From 1878 to 1882 he was professor of law at West Point. He became assistant judge-advocate-general, with rank of colonel, in 1884, and was judge-advocate-general of the United States Army from 1895 to 1901, in which capacity he was one of the most valuable advisers of President McKinley during the Spanish-American War. His publications include several important treatises on the laws of war, such as *The Use of the Army in Aid of the Civil Power* (1898), and *Remarks on the Army Regulations* (1898).

LIEBER, or **LIEBLER,** THOMAS. A Swiss physician and theologian, better known under the Latinized form of his name, Erastus (q.v.).

LIEBERMANN, lē'bēr-mân, MAX (1849—). A German artist, born in Berlin. He studied at the University of Berlin, received his artistic training at the Weimar Academy, first exhibited in 1874, and after further studies in France became one of the foremost German representatives of the *plein-air* school. During a residence in Holland he studied the work of Israels, and derived *motifs* for numerous later pictures. From 1879 to 1884 he was active at Munich, where his "Christ in the Temple" evoked much unfavorable comment at the International Exhibition (1879). His canvases frequently have been criticised as commonplace and ugly in subject and blackish and dull in treatment. They include principally landscapes with figures, and genre scenes of Dutch life. Noteworthy among them are: "Flax-Shed at Laren, Holland" (National Gallery, Berlin); "Street in Zandvoort;" "The Weaver;" "The Shoemaker's Workshop;" "Hospital Garden at Leyden;" and "The Turnip-Field." Liebermann worked also in crayon (portrait of Dr. Bode) and pastel (portrait of Hauptmann), and executed several etchings. Consult the biography by Kämmerer (Leipzig, 1893).

LIEBHARD, lēp'härt, JOACHIM. The correct name of the German Classicist generally known as Joachim Camerarius (q.v.).

LIEBIG, lē'bĭk, JUSTUS VON, Baron (1803-73). One of the greatest chemists of the nineteenth century. He was born at Darmstadt, Germany, the son of a dealer in dyestuffs. He early showed a strong predilection for natural science. At the age of fifteen he became apprenticed to an apothecary at Heppenheim, near Darmstadt. Soon after he entered the University of Bonn, then went to Erlangen, where he took his doctor's degree in 1822. In that year he published a paper on fulminating mercury, and in 1823 went to Paris, where, by further researches on the fulminates, he soon attracted the attention of Alexander von Humboldt. Humboldt introduced Liebig to Gay-Lussac, Thénard, and Dulong, and the young German chemist was hospitably received in the laboratory of Gay-Lussac. At the recommendation again of Humboldt, Liebig was made professor of chemistry at the University of Giessen (1824), where he remained for more than a quarter of a century, attracting students from all parts of Germany and from foreign countries. In 1845 the Grand Duke of Hesse raised him to the rank of baron. In 1852 he became professor of chemistry at Munich, and in 1860 president of the Academy of Sciences and curator-general of the scientific collections of Bavaria. He remained in Munich until his death.

When Liebig began his career chemistry was in its infancy. Above all, organic analysis was in an extremely undeveloped state; so that a great deal of ingenuity was required in carrying out what are now very simple analytical determinations. At the time of Liebig's death chemistry, both pure and applied, had developed beyond all expectations; and Liebig had contributed more than any one of his contemporaries to its prodigious growth. Liebig established the first laboratory where students might receive a thorough practical training in chemistry, to supplement the instruction given in the lecture-room (see LABORATORY), and in Liebig's own laboratory some of the most distinguished nineteenth-century chemists were trained. Another great service was his introduction of the well-known method of organic analysis. (See CHEMISTRY, section *Organic Chemistry.*) The number of carbon compounds discovered and studied by Liebig himself was very great. He analyzed many important natural alkaloids; investigated the action of chlorine on alcohol and discovered chloral and chloroform; studied the products of oxidation of alcohol and discovered aldehyde; determined the basicity of many organic acids; investigated the chemical composition of urine and the derivatives of uric acid; analyzed the juice of flesh, etc. His theory of the constitution of alcohol, ether, and chloroethane, and the celebrated research carried out jointly with Wöhler (q.v.) on the benzoyl compounds, gave a powerful impulse to the development of chemical theory. Among his contributions to chemical technology may be mentioned his method of making the cyanide of potassium, a compound extensively used in electroplating and in the manufacture of ferrocyanides. The discovery of aldehyde, mentioned above, has led to important improvements in the manufacture of mirrors and of vinegar.

The phenomena of animal and vegetable life formed one of Liebig's favorite branches of research, and he was the first to advance the theory that the activity of physical and chemical forces is the same in the organized as in the mineral world. He proved experimentally that animal heat is nothing but the energy liberated by the combustion in the organism mainly of fats and carbohydrates. Foods which serve as fuel and supply the heat of the body he termed respiratory foods. Nitrogenous substances, which —as he showed—serve to build up the tissues of the body, he termed plastic foods. He was also the first to prove that the transformation of inorganic into organic substances takes place exclusively in the organisms of plants, from which animals receive ready-formed the principal substances of their flesh and blood. Plants, on the other hand, receive their nourishment from the soil and the air, the former supplying them with the sulphates, sulphites, and phosphates of sodium, potassium, calcium, magnesium, and iron; while the atmospheric air supplies them with carbonic acid, water, ammonia, and nitric acid. It thus became clear that, in order to maintain the fertility of the soil, the saline ingredients necessary for the growth of plants must from time to time be restored to it, either in isolated form or in the form of the sewage of towns, in which they are contained in considerable quantity. The importance to agriculture of the manufacture of saline fertilizers, which has thus originated in Liebig's researches, is inestimable, and Liebig may justly be considered as one of the founders of agricultural chemistry. See CHEMISTRY, AGRICULTURAL.

Liebig's *Chemistry in Its Application to Agriculture and Physiology* appeared in Brunswick and in London in 1840. The second part of this epoch-making work was published under the title, *The Natural Law of Husbandry* (Brunswick, 1862; London, 1863). His *Animal Chemistry, or Chemistry in Its Application to Physiology and Pathology,* appeared in 1842 (Brunswick and London; 3d German ed., Brunswick, 1846). An English translation of his paper on foods appeared in London in 1847, under the title, *Researches on the Chemistry of Food.* The celebrated *Handbook of Organic Analysis* was published in Brunswick and in London in 1853. Liebig's publications further include: *Handwörterbuch der Chemie*, the compilation of which he began in conjunction with Poggendorff (9 vols., Brunswick, 1836-64, and a later edition); *Handbuch der organischen Chemie* (Heidelberg, 1839-43); *Theorie und Praxis in der Landwirtschaft* (Brunswick, 1856); *Naturwissenschaftliche Briefe über die moderne Landwirtschaft* (Leipzig, 1859), etc. The celebrated *Chemische Briefe* (*Familiar Letters on Chemistry*) first appeared in the *Augsburger Allgemeine Zeitung* (6th German ed. Leipzig, 1878); it has been translated into most European languages. The list of Liebig's scientific papers comprises more than 300 titles, each paper forming a valuable contribution to organic science. In his private life Liebig was kind and hospitable, noble in thought and generous in feeling. Numberless honors were bestowed upon him. Consult Hofmann, *The Life-Work of Liebig in Experimental and Philosophic Chemistry* (London, 1876).

LIEBKNECHT, lēp'knĕKt, WILHELM (1826-1900). A German social democrat, born at Giessen. He studied in the university there and at Berlin and Marburg. In 1848 he took part in the revolt in Baden; was imprisoned, but escaped in May of 1849, going first to Switzerland and then to London. There he earned his living as correspondent for German newspapers and as a member of the *Communistenbund*, associated with Marx and Engels. In 1862 he took advantage of the amnesty, returned to Germany, and began to write for the *Norddeutsche Allgemeine Zeitung.* But in 1865 he was banished from Berlin and Prussia for socialistic agitation. Two years later he was elected to the North German Parliament, and in 1868 he began to edit the *Demokratisches Wochenblatt*, in which he attacked Bismarck so bitterly that in 1872 he was imprisoned for two years, with his fellow-editor Bebel. But before he was released he had been elected to the German Reichstag. Save for brief periods he sat there until his death. In 1879 he was elected to the Second Chamber of the Saxon Legislature. He was editor of the Berlin *Vorwärts* from 1890 to 1900, and in 1895 was imprisoned for four months on the charge of lèse majesté. He wrote: *Zur Grund- und Bodenfrage* (1876); *Ein Blick in die neue Welt* (1886), relating his impressions of a trip to the United States made in that year; *Robert Blum und seine Zeit* (2d ed. 1890); *Geschichte der französischen Revolution* (1890); *Die Emser Depesche* (5th ed. 1892); *Robert Owen* (1892); and *Volksfremdwörterbuch* (7th ed. 1894).

LIEBLEIN, lēb′līn, Jens Daniel Carolus (1827—). A Norwegian Egyptologist, born at Christiania. He studied in the University of Christiania, at Berlin under Brugsch and Lepsius, in Paris and Turin at the expense of the State, and later at London and Leyden. He was made professor at Christiania in 1876. As representative of Norway he was present at the opening of the Suez Canal (1869), and traveled in Egypt again in 1887-88 and 1899-1900. His earliest publication was *Aegyptische Chronologie* (1863), which did much to systematize that branch, especially in the sequel; *Recherches sur la chronologie égyptienne d'après les listes généalogiques* (1873). His other works include: *Dictionnaire des noms hiéroglyphiques, en ordre généalogique et alphabetique* (1871), which is supplemented by *Hieroglyphisches Namenwörterbuch* (1891); *Gammelægyptisk Religion* (1883-85); *Handel und Schiffahrt auf dem rothen Meere in alten Zeiten* (1886); *Le livre égyptien: Que mon nom fleurisse* (1895).

LIEBLING, lēb′lĭng, Emil (1851—). A German-American pianist and composer, born in Pless, Silesia. He studied music and the piano with Ehrlich, Dorn, and Kullak in Berlin, and with Dachs in Vienna. In 1867 he came to the United States, where he settled as a music-teacher. Upon a subsequent visit to Europe he studied under Liszt at Weimar. After 1872 he was identified with the musical life of Chicago. His compositions include piano pieces and songs, the most of which have met with considerable popular favor.

LIEBLING, Sally (1859—). A German pianist, born at Posen. He studied music and the piano under Bendel, Kullak, and Weitzmann in Berlin. He made a number of concert tours in Germany, and with Thomas's Orchestra in the United States (1875). He subsequently gave many recitals with well-known artists. In 1884 he studied for a time under the direction of Liszt at Weimar, and in 1888 founded the new conservatory of music at Berlin.—His brother, Georg (1865—), also became a distinguished musician. He studied the piano under the best masters, and made many European concert tours. In 1890 he was made Court pianist to the Duke of Saxe-Coburg-Gotha. His salon compositions are noteworthy, especially the *Air de Ballet* and *Romance;* a gavotte, and the vocal *Lieblingswalzer*, sung with great success by Nikita.

LIEBMANN, lēb′män, Otto (1840—). A German philosopher, born at Löwenberg and educated at Leipzig and Halle. He was made professor at Strassburg (1872) and went to Jena in 1882. His writings are: *Vier Monate vor Paris*, a journal published anonymously (1871); *Kant und die Epigonen* (1865), in which, criticising the followers of Kant, he urged a return to their master and became the first of the Neo-Kantians; *Ueber die Freiheit des Willens* (1866); *Ueber den objektiven Anblick* (1869), and *Analysis der Wirklichkeit* (3d ed. 1900); *Gedanken und Thatsachen* (1882-99); *Klimax der Theorieen* (1884); *Geist der Transcendentalphilosophie* (1901); *Grundriss der kritischen Metaphysik* (1901).

LIEBRECHT, lēb′rĕkt, Felix (1812-90). A German linguist and folklorist, born at Namslau. Educated at Breslau, Munich, and Berlin, he became professor of German at the Athénée Royal in Liège in 1849, and retired in 1867. He was the author of many valuable translations with excellent notes—for example, of Giambattista Basile's *Pentamerone* (1846), with an introduction by Jakob Grimm; of *Barlaam und Josaphat*, by Damascenus (1847); of Dunlop's *Geschichte der Prosadichtungen* (1851); and of the *Otia Imperialia* of Gervase of Tilbury (1856). Various monographs of his were collected under the title *Zur Volkskunde* (1879).

LIEBREICH, lē′brīk, Oskar (1839—). A German pharmacologist. He was born at Königsberg, studied chemistry under Fresenius in Wiesbaden and medicine in Königsberg, Tübingen, and Berlin, and in the last-mentioned university became assistant in 1867, professor of therapeutics in 1868, and director of the pharmacological institute in 1872. He introduced the method of phaneroscopic illumination for the study of lupus; showed the value of cantharidin in tuberculosis, of mercuric formamide and of lanolin in syphilis, of butylchloral hydrate and of ethylene chloride as anæsthetics, and of chloral hydrate as a soporific; and in 1865 gave the name protagon to a proximate principle discovered in the brain and in blood-corpuscles. Liebreich edited the *Therapeutische Monatshefte* (1887 sqq.) and the *Encyklopädie der Therapie* (1895 sqq.), and with Langgaard published a *Kompendium der Arzneiverordnung* (5th ed. 1902).

LIECHTENSTEIN, lĕk′ten-stīn. An independent principality, lying between Austria and Switzerland, with the exception of Monaco and San Marino the smallest independent State of Europe. It is bounded by Vorarlberg on the north and east, and the Swiss Cantons of Grisons and Saint-Gall on the south and west. The area is sixty-five square miles. The surface is extremely mountainous except in the western part. The country is traversed north and south by two ramifications of the Rhætian Alps, and reaches in the Naafkopf an altitude of about 8440 feet. The Rhine forms the western boundary of Liechtenstein. The valley of the Samina, a tributary of the Ill, separates the mountain chains in the south. The climate is generally mild and healthful, but sudden storms are frequent. Agriculture, gardening, stock-raising, weaving, and the production of wine and of various wooden articles are the principal industries. Liechtenstein has belonged since 1866 to the Austrian Customs-Union. Its annual share of the customs receipts amounts to about $8000.

The principality is a constitutional monarchy, with the crown hereditary in the male line. The Constitution, first adopted in 1862 and modified in 1878 and 1895, vests the legislative power in the Prince and in a Landtag of fifteen members, three appointed by the Prince and twelve elected indirectly, for four years. The highest administrative authority is the Court of Chancellery at Vienna, to which the administration at Vaduz, the capital, is subordinate, and which serves also as a court of the second instance. The highest judicial authority of the principality is the Supreme Court at Innsbruck. The inhabitants are free from military duty as well as from direct taxes. The revenue and expenditures for 1900 amounted to $155,912 and $142,987 respectively. The principality has no public debt and no mint; the Austrian currency and the Austrian weights and measures and postal system are used. Liechtenstein forms a part of the Catholic Bishopric of Chur, Switzerland. Population, in 1891, 9434. The inhabitants are German. The reigning house of Liechtenstein dates from the twelfth century. In 1719 the two principalities of Vaduz and Schellenberg were recognized by the Emperor Charles VI. as an independent principality, whose princes acquired a seat in the Reichstag in 1723. Liechtenstein left the Germanic Confederation in 1866, and has since been politically independent, though economically allied with Austria. The Prince of Liechtenstein resides for the most part at Vienna.

LIED, lēt (Ger., song). A German term which has no equivalent in any other language, denoting an art-form established by Franz Schubert and extensively cultivated since then by composers of all ranks and nationalities. The Germans also use the term *Kunstlied* to distinguish the art-form of Schubert from the *Volkslied* or folk-song, from which it is a natural development. During the latter half of the eighteenth century several German composers began to compose simple songs which were consciously modeled after the old folk-songs and were called *volkstümliche Lieder*. J. A. Hiller (1728-1804) may be regarded as the father of this style. A. T. Schulz and his followers created the short symmetrical *liedform*. By means of this the composer was enabled on the one hand to preserve the unity of mood (*Stimmung*), on the other to reproduce faithfully the spirit of the individual word by means of proper declamation and harmonization. Schubert's rare genius raised this simple form at once into the domain of the highest musical art. The next step was the broadening of the strophic form into the *durchkomponierte Lied*. In the strophic form all the verses are set to the same music. The *durchkomponierte Lied* pays more attention to the individual word by allowing different musical themes for different stanzas. Schubert succeeds in preserving artistic unity by various means, repetition of some musical phrase, insistence upon some rhythmic or melodic figure in the piano-part, etc. Besides Schubert other great composers of the lied are Schumann, R. Franz, Liszt, Rubinstein, Mendelssohn, Jensen, Brahms, Grieg, and Tschaikowski.

LIEDFORM, lēt′fōrm (Ger., song-form). A musical form very much employed in instrumental music and borrowed originally from the strophic lied. It consists of three sections with two themes, A, B, A. See Form.

LIÈGE, lē-āzh′ (Flem. *Luik*, Ger. *Lüttich*). The capital of the Belgian province of the same name, and one of the most important manufacturing centres of Belgium, situated on both banks of the Meuse at its confluence with the Ourthe, in a region remarkably picturesque (Map: Belgium, D 4). The hills which form the background of the city on both sides of the river are fortified by a circle of detached forts. The Meuse makes an island at Liège, and divides the city into two parts, the old town on the left bank, containing the principal public buildings, and the new town on the right bank, being given up chiefly to manufacturing industries. The river is spanned here by six main bridges, of which the Pont des Arches is the most attractive. Liège has good water-works, electric lighting, and excellent local transportation. The centre of the city, the Square d'Avroy, is splendidly laid out and is adorned with an equestrian statue of Charlemagne. Chief among the churches is the fine Cathedral of Saint Paul, founded in 968 and completed in 1528. It is built mainly in Gothic style, has a richly ornamented interior, a noteworthy pulpit and paintings. The splendid Church of Saint Jacques dates from 1056 and possesses an attractive interior; the Basilica of Saint Barthélemy is of the twelfth century, and has a remarkable bronze font of the year 1112. Among other churches may be mentioned Sainte Croix, a curious pile built in 970, but repeatedly restored since then; and Saint Martin, founded in 962 and rebuilt in Gothic style in 1542. Perhaps the most striking building of Liège is the Palais de Justice. It was constructed as an episcopal palace in 1508-40, and was entirely restored in 1848-56. The exterior is ornamented with sculptures. The most interesting part of the building is the two interior courts surrounded by vaulted arcades and unique columns, a mixture of Gothic and Renaissance. Some of the rooms in the building are furnished with royal splendor. The building contains, besides the law court and the provincial administration offices, an interesting archæological museum. The theatre is a modern building (1808-22) modeled after the Odéon in Paris. In front of it stands a bronze statue of the composer Grétry, who was born here. The university buildings are also modern and scattered all over the city. The university, founded in 1817 by the Dutch Government, is a State institution, has faculties of philosophy, jurisprudence, mathematics and natural sciences, medicine and technology, with an attendance of about 1100 students, including 200 foreigners. Its natural history museum is rich in the remains of antediluvian animals found in caverns in the district. Attached to the university are a library of 200,000 volumes, anatomical and physiological institutes, a chemical laboratory, and a zoölogical institute. The other important educational institutions of Liège are the Ecole des Mines et des Arts et Manufactures and the Ecole Electro-Technique, both affiliated with the university; a seminary for teachers, an episcopal seminary, an academy of art, a royal conservatory of music (attended by 600 pupils and famous for its teaching of stringed instruments), institutions for the blind and the deaf and dumb, and a number of scientific organizations.

The municipal museum, situated in the old cloth hall, contains a small collection of paintings, chiefly by native artists. Liège has both zoölogical and botanical gardens. From the lofty citadel, erected in 1650, there is a magnificent view. Industrially the city is noted for its extensive manufactures of weapons, which give employment to a large portion of the artisan population. A characteristic feature about this branch of production is that it is still carried on as a house industry. Naturally, however, it has begun to feel the effect of the competition of other countries where the industry is more modern in its organization. Among the larger weapon-factories may be mentioned the royal gun-factory and cannon-foundry. The proximity of rich coal-mines makes Liège an important iron and steel centre, its products including different tools and instruments, heavy machinery, needles, nails, etc. Watches, gold and silver articles, mirrors, cloth, leather, paper, oil, and chicory are also among the manufactures, and Liège has large zinc-foundries. Its commerce is of great extent; there is considerable navigation in the port. Liège is the seat of a bishop and a United States consul. Population, in 1890, 147,660; in 1900, 173,706, chiefly Walloons (q.v.).

The city is believed to have had its origin in a Roman colony. It became the residence of a bishop at the beginning of the eighth century, and its history may be epitomized as a continual struggle between its citizens and the bishops, who were princes of the Holy Roman Empire. The latter frequently employed foreign armies to crush the rebellious spirit of the townspeople. In 1468 it was taken by Charles the Bold of Burgundy and later by Maximilian I. During the seventeenth century it was seized repeatedly by the French, and it fell before Marlborough in 1702. In 1801 it was ceded to France by the Treaty of Lunéville. In 1815 it was annexed to the United Netherlands, and in 1830 it passed to Belgium.

LIÉGEARD, lyā'zhär', FRANÇOIS EMILE STEPHEN (1830—). A French author, born at Dijon. Educated as a lawyer, he entered politics, and from 1867 to 1870 was a member of the Legislative Assembly. After the fall of the Empire he was obliged to retire from public life. His publications include the following collections of poems: *Les abeilles d'or* (1859); *Le verger d'Isaure* (1870); *Les grands cœurs* (1883), crowned by the Academy; *La côte d'azur* (1888), crowned by the Academy; and *Rêves de combat* (1892).

LIEGNITZ, lēᴋ'nĭts. A town in the Province of Silesia, Prussia, capital of the former Principality of Liegnitz, at the confluence of the Schwarzwasser and the Katzbach, 40 miles by rail west-northwest of Breslau (Map: Prussia, G 3). The principal churches are that of Saint John, containing monuments of the dukes of Liegnitz and Brieg, of the House of Piast, and that of Saints Peter and Paul, dating from the fourteenth century and recently restored. The royal castle, destroyed by fire in 1835, has been restored and is used as a Government building. Liegnitz has a municipal gymnasium founded in 1309, an academy for the children of noblemen, a seminary for female teachers, a museum of antiquities, and a theatre. Cloth, machinery, pianos, shoes, tobacco, oil, woolens, wagons, and glazed brick are largely manufactured, and vegetables are extensively cultivated in the gardens of the suburbs. Liegnitz is first mentioned in 1004 and was after 1164 the residence of the dukes of Liegnitz. Near Liegnitz, on the battlefield known as the Wahlstatt, the Silesians, Poles, and Teutonic Knights fought a bloody battle with the Mongols in 1241. As a fortified town it figured prominently in many wars. It has been in possession of Prussia since 1742. Here in 1760 Frederick the Great defeated the Austrians under Laudon. Population, in 1890, 46,874; in 1900, 54,839.

LIEN (Fr. *lien*, bond, from Lat. *ligamen*, band, from *ligare*, to bind). In law, a security or hold over goods or land, and the right to retain or take the same for a debt which is due. Liens exsit (1) at common law, (2) in equity, (3) in admiralty, and (4) by statute; and each of these differs from the others in character and in its effect upon the property. (1) Liens upon chattels were recognized and enforced at common law in favor of innkeepers, common carriers, attorneys, warehousemen, factors, and any one who had performed work upon a chattel in his possession—all of which attached by implication of law without any express agreement. A lien might also be created by a contract or agreement between the debtor and creditor by which the debtor deposited personal property with the creditor as security for his debt (see PLEDGE), or in a particular business or trade by a usage so extensive and well established that the courts of law will recognize it. (See CUSTOM.) In general, a lien cannot be acquired against the owner of a chattel when possession is given to the would-be lienor by one wrongfully having possession of the chattel. Innkeepers may, however, acquire a lien on stolen goods brought to them by a thief. This constitutes the one important exception to the general rule. Possession of the property by the lienor is essential to a common-law lien; for as soon as the goods are voluntarily parted with by him the lien is gone. The lienor's only right at common law was to retain possession of the property until his claim was paid. He could not sell or otherwise dispose of it. Equity, however, early took jurisdiction to relieve the lienor by allowing him to foreclose his lien and collect the amount due from the proceeds of the judicial sale of the chattels. In many States the lienor now has statutory authority to sell chattels on which he has a lien and apply the proceeds to the payment of the debt.

A common-law lien may be either general or specific. It is *general* when it may be enforced for a general balance due from the owner to the lienor, and is not confined to the amount due upon or on account of the specific article over which it exists. (See LIEN, GENERAL.) A *specific* lien is one over specific goods for a debt contracted in respect to them alone, as for the price of them or for some labor or services expended upon them. Thus, a vendor of goods has a special lien upon them while they remain in his possession with the price due and unpaid, after the title to them has passed to the vendee. A miller has a special lien on the flour he has ground, an artisan on the article he has repaired, etc. Warehousemen and carriers have what has been called a general-special lien—i.e. if an owner place a large quantity of goods in their custody at one time, they may retain any portion of them in their possession for their charges upon the entire quantity, but they have no lien for charges upon goods placed with them at other times. Common carriers also have a lien for charges paid by them to connecting carriers upon the goods upon which a lien is claimed. The right of stoppage in transitu—that is, the right of a vendor to retake goods in transit before delivery to vendee in case of the insolvency of the vendee, as security for the purchase price—although originally equitable in character, is now recognized and enforced by courts of law.

(2) Equitable liens, or those enforced by a court of equity only, are in the nature of constructive trusts (see Trust); that is, the owner of property is compelled to apply his property in certain cases specifically to the payment of his debt. Equitable liens, unlike common-law liens, may be either upon real or personal property and do not depend on the possession by the lienor. Equitable, like common-law liens, may arise by implication of law. Thus the vendor of real estate who has given a deed of the property to the vendee has a lien to secure the payment of the purchase price; and the vendee who has paid the purchase price without securing a deed has a lien upon the land to secure the money so paid. Of like character are the reciprocal liens of partnership upon the partnership property, and the lien of *lis pendens* (q.v.). Equitable liens arise more frequently from contract or agreement. An agreement for a lien or security which falls short of a legal mortgage or pledge will be enforced in equity as between the parties and against third parties who are not purchasers for value. The rights of third parties with reference to equitable liens are now variously affected by statutes for the recording of lien and mortgage. See Recording Acts.

(3) Liens in admiralty are similar to those in equity. Like the latter, they do not depend upon possession. They are enforced by means of a libel filed in the admiralty court upon the vessel or property upon which the lien is claimed. See Admiralty Law; Maritime Law.

(4) Important liens also exist by virtue of statutes. One of the most beneficent of these is the lien given to merchants and material men for work and material furnished for the erection of buildings, another is the judgment lien upon real property, and still another, the lien given to boarding-house keepers and innkeepers on the goods of their boarders for the amount of board furnished and unpaid for. Most statutory liens are acquired by filing a notice of the lien in the appropriate office for similar records, usually the office of the county clerk; and they are enforced by judicial proceedings corresponding to foreclosure. Consult the authorities referred to under such titles as Carrier, Common; Inn, Innkeeper; Pledge; Mortgage; and also consult: L. A. Jones, *Treatise on the Law of Liens, Common Law, Statutory, and Equitable* (2d ed., Boston, 1894); Kneeland, *Mechanics' Liens* (3d ed., New York, 1893).

LIEN, General. In English and American law, the right which a party has to retain a chattel as security for the payment, not only of the particular sum for which such article was pledged, but of any balance that may be due on general account in the same line of business. General liens do not exist at common law, but depend upon agreement, either express or implied, or upon the usage of trade. As a lien rests upon the right to retain possession, it is lost by abandonment of the possession of the goods. In Scotland, a similar right exists, under the title of retention. See Lien.

LIENHARD UND GERTRUD, lĕn'härt ŋnd gĕr'trōōt, Ein Buch fur das Volk. An educational novel, published by Johann Heinrich Pestalozzi (q.v.) in 1781, embodying his main educational ideas. It excited great interest among all classes of readers and brought the author immediate fame. The Government of Bern recognized his genius by presenting him with a gold medal. Besides showing the author's educational views, the work is of considerable value to the student of history, as a realistic picture of the rural life of Switzerland at that time.

LIER, lēr, Adolf (1826-82). A German painter, born at Herrnhut, Saxony. He studied at Basel under Süffert, and at Munich under Zimmermann. Afterwards he was with Jules Dupré in Paris for a year and at Isle-Adam. In 1865 he went to London. Upon his return he taught at Munich from 1869 to 1873, and became the head of a school of landscape painters which has had considerable influence on German art. His subjects are usually storms or evening effects: "The Oise by Moonlight" (1867, Dresden Gallery); "Evening on the Isar" (1877, National Gallery, Berlin); "Harvest in Upper Bavaria" (Leipzig Museum); and "Theresienwiese zu München" (1882, New Pinakothek, Munich).

LIERNE (lyârn) **RIB** (Fr., perhaps for *lienne*, warp-thread uncrossed by the woof, from *lier*, from Lat. *ligare*, to bind). A minor rib in Gothic vaulting used rather for decorative than constructive purposes. It was most generally used in England, where the name is applied to all but the diagonal, transverse and wall ribs; but in France, where the use of all minor ribs came much later and less generally, such minor ribs when they spring from the piers are called *tierceron* ribs. The vaulting in which they are used is called lierne vaulting.

LIERRE, lyâr (Flem. *Lier*). A town of Belgium, in the Province of Antwerp, 8 miles by rail southeast of the city of Antwerp, at the confluence of the Great and Little Nethe (Map: Belgium, C 3). Its Church of Saint Gommarius, built in 1425-1557, is a fine late Gothic building. It contains a number of excellent paintings, including two by Rubens. Lierre manufactures silk, lace, sugar, shoes, etc. Population, in 1890, 20,133; in 1900, 22,654.

LIEUTENANT (OF., Fr. *lieutenant*, It. *luogotenente*, from ML. *locum tenens*, one who holds another's place, from Lat. *locus*, place, and *tenere*, to hold). A subaltern military rank. In the United States a military cadet on appointment to the army receives the grade of second lieutenant, becoming first lieutenant in the order of seniority as vacancies occur. In the British service second lieutenants are appointed lieutenants in their regiments or corps as vacancies occur. The number of lieutenants per company varies in many European armies, but the general average is two or three to each captain or company. The duties of a lieutenant the world over are to assist the captain under whom he serves, and to supervise the routine details connected with the interior economy of his corps or regiment, as officer of the guard, officer of the day, orderly officer, etc. On active service he would usually have command of examining guards, patrols, and pickets. In the United States Army it frequently happens that, owing to the scattered posts and detachments, the first lieutenant is virtually the company commander, and exercises all the functions and performs all the duties incident to the rank of captain.

Lieutenant, Naval. An officer of the United States Navy, above the rank of ensign and below that of lieutenant-commander. There are two grades of lieutenants—those of the senior grade ranking with captains of the army, and those of the junior grade with first lieutenants of the army. In 1902 there were on the active list of the United States Navy 300 lieutenants of the senior grade and 350 junior lieutenants and ensigns (these grades are grouped together, no definite number being assigned to either separately). The pay of lieutenants when at sea is the same as that of officers of corresponding rank in the army, but on shore it is 15 per cent. less. The lieutenants of both grades are the navigating, watch, and division officers on board vessels of all classes, except first-rates, which usually have lieutenant-commanders for navigators. When in charge of a vessel's deck they are the representative of the commanding officer, and their authority, subject to the orders of the executive officer, is recognized in all matters pertaining to the management and police of the vessel that come under their supervision. It is also their duty to see that a bright lookout is kept, that the vessel is properly steered, the sails trimmed, and the subordinate officers and the men of the watch are at their stations. In charge of a gun division they are held responsible for its efficiency in all respects. See Rank and Command.

LIEUTENANT-COLONEL. The intermediate rank between major and colonel. In the United States Army his duties are to assist the colonel in command of the regiment.

LIEUTENANT-COMMANDER. An officer of the United States Navy above the rank of lieutenant and below that of commander. The grade was established upon the reorganization of the navy in 1862. Lieutenant-commanders rank with majors in the army and have the same pay when at sea, but on shore duty their pay is 15 per cent. less. A lieutenant-commander may command a ship of the fourth rate or a ship not rated or serve as executive officer, navigator, or senior engineer officer in a ship commanded by an officer of a superior grade. On shore he performs such duties as may be assigned him. Lieutenant-commanders who were formerly engineer officers, and are by law restricted to the performance of engineering duties, are assigned accordingly both at sea and on shore.

LIEUTENANT-GENERAL. (United States Army). According to the act of May 28, 1798, the President is authorized to appoint, by consent of the Senate, a commander of the army. It is provided that the commander of the army, as well as other officers appointed under the act, may be discharged whenever in the opinion of the President the public safety justifies it. Originally the commander was commissioned as lieutenant-general, but on March 3, 1799, it was enacted that this rank be abolished, and the title of general substituted. On February 15, 1855, the grade of lieutenant-general was revived that it might be conferred on Major-General Scott for his services in the Mexican War. In February, 1864, an act of Congress was passed directing that the grade of lieutenant-general be again revived (General Scott having retired in 1861). On March 2, 1864, Major-Gen. U. S. Grant received the appointment, followed on July 25, 1866, by Major-Gen. W. T. Sherman, the grade of general having been revived for Lieutenant-General Grant. When the latter was elected President of the United States, Lieutenant-General Sherman was made general, Major-Gen. P. H. Sheridan becoming lieutenant-general. An act of Congress, 1870, abolished the office of lieutenant-general and general as soon as vacated. Major-Gen. J. M. Schofield was promoted to the grade of lieutenant-general by act of Congress on February 5, 1895, retiring from active service as such on September 29, 1895. Major-Gen. N. A. Miles succeeded as commanding general of the army, the rank of lieutenant-general being again revived and conferred on him in 1900.

LIEVEN, lē̆′vĕn, Dorothea, Princess of (1784-1857). A woman once prominent in the diplomatic circles of Europe, the daughter of Christoph von Benkendorf, an Esthonian of the middle class. She was born at Riga, and received a brilliant education. She was married in 1800 to Prince Christoph Lieven, Russian Ambassador to Prussia, displayed remarkable diplomatic aptitude, and soon enjoyed a Continental reputation. On her husband's appointment to the Court of Saint James in 1812, she speedily established herself in a firm position in the political and fashionable society of London. In 1837, upon the death of her husband, she removed to Paris. Here her salon was the centre of schemes and intrigue involving the interests of half of Europe.

LIEVENS, lē̆′vĕns, **LIVENS,** or **LIEVENSZ,** Jan (1607-74). A Dutch painter, born at Leyden. He studied at an early age under Joris van Schooten, and later with Peter Lastman at Amsterdam. His work became known in England through the Prince of Orange, who presented one of his pictures to Charles I., and the King invited him to visit his Court. There the artist remained three years. On his return he went to Antwerp. He painted religious and historical subjects and also portraits. As an engraver he takes a high rank; his plates are somewhat in the manner of Rembrandt.

LIEZEN-MAYER, lē̆′tsen-mī′ĕr, Alexander von (1839-98). An Hungarian painter and illustrator, born at Raab. After pursuing the usual routine course of study at the academies of Vienna and Munich he became the pupil of Piloty in 1862, and forthwith attracted attention with two episodes from the history of his native land, "Queens Mary and Elizabeth of Hungary at the Tomb of Louis the Great," and "Coronation of Charles of Durazzo." Three years afterwards he won a first prize, and was commissioned by the Academy to paint "Canonization of Elizabeth of Thuringia." Signal success came to him in 1867 with the completion of his "Maria Theresa Nursing a Poor Woman's Child." The masterly efforts in portraiture to which he now devoted himself for a period led to his being called to Vienna in 1870 to paint the portrait of Emperor Francis Joseph, and numerous subsequent commissions in the same line detained him there for two years. After his return to Munich he painted, among others, "Elizabeth Signing the Death Warrant of Mary Stuart" (1873), now in the Museum at Cologne. That he was a draughtsman of the first rank is amply proved by his illustrations to Goethe's *Faust* (fifty cartoons) and Schiller's *Lay of the Bell* (thirty-two), done between 1874 and 1880. One of his most impressive creations is "Saint Elizabeth Giving Her Cloak to a Poor Woman" (1882), in the National Museum at Budapest. He was appointed director of the School of Art at Stuttgart in 1880, but returned to Munich in 1883, and in the same year was made professor at the Academy.

LIFE, Mean Duration of. The average length of life enjoyed by a given number of persons of the same age. Of 100,000 persons aged ten years, 749 die the first year. Of the remainder, 746 die in the next year. Following up the deaths each year until all die, it is ascertained that the average age to which a number of the group of 100,000 survives is 48.7 years. This is called, in other words, one's 'expectation of life.' Though many die sooner, a boy of ten years may expect to live to be 48.7 years old. If he survives to that age, his expectation at 59 years is that he will live 14.7 years longer, as that is the average age reached by the 59,385 survivors of the original group of 100,000 who attain the age of 59.

Following is an 'Expectation Table' constructed for the use of insurance companies from the American Table of Mortality, which has been adopted by the State of New York as the standard for valuation of insurance policies:

COMPLETED AGE	Number surviving at each age	Deaths in each year
10	100,000	749
11	99,251	746
12	98,505	743
13	97,762	740
14	97,022	737
15	96,285	735
16	95,550	732
17	94,818	729
18	94,089	727
19	93,362	725
20	92,637	723
21	91,914	722
22	91,192	721
23	90,471	720
24	89,751	719
25	89,032	718
26	88,314	718
27	87,596	718
28	86,878	718
29	86,160	719
30	85,441	720
31	84,721	721
32	84,000	723
33	83,277	726
34	82,551	729
35	81,822	732
36	81,090	737
37	80,353	742
38	79,611	749
39	78,862	756
40	78,106	765
41	77,341	774
42	76,567	785
43	75,782	797
44	74,985	812
45	74,174	828
46	73,346	848
47	72,497	870
48	71,627	896
49	70,731	927
50	69,804	962
51	68,842	1,001
52	67,841	1,044
53	66,797	1,091
54	65,706	1,143
55	64,563	1,199
56	63,364	1,260
57	62,104	1,325
58	60,779	1,394
59	59,385	1,468
60	57,917	1,546
61	56,371	1,628
62	54,743	1,713
63	53,030	1,800
64	51,230	1,889
65	49,341	1,980
66	47,361	2,070
67	45,291	2,158
68	43,133	2,243
69	40,890	2,321
70	38,569	2,391
71	36,178	2,448
72	33,730	2,487
73	31,243	2,505
74	28,738	2,501
75	26,237	2,476
76	23,761	2,431
77	21,330	2,369
78	18,961	2,291
79	16,670	2,196
80	14,474	2,091
81	12,383	1,964
82	10,419	1,816
83	8,603	1,648
84	6,955	1,470
85	5,485	1,292
86	4,193	1,114
87	3,079	933
88	2,146	744
89	1,402	555
90	847	385
91	462	246
92	216	137
93	79	58
94	21	18
95	3	3

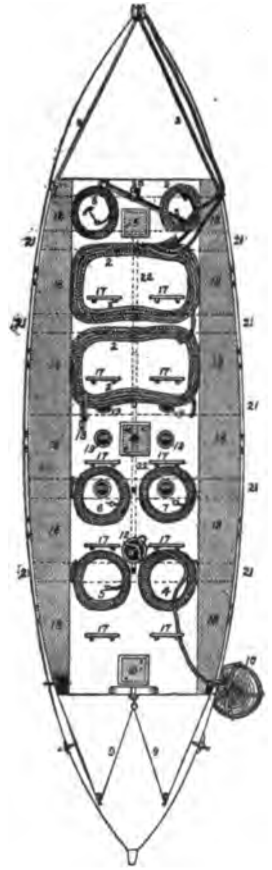
LIFE AND ADVENT UNION. See Adventists.

LIFEBOAT. A boat specially constructed for saving persons from wrecked or imperiled vessels, in storms or heavy seas, when the use of an ordinary open boat would be impossible or extremely dangerous. There have been countless contrivances for this purpose, all varying in their types; but unless a boat is provided with some distinctive properties, such as those of self-bailing or self-righting, or both combined, it is not considered a lifeboat in the strict meaning of the term. The conventional open boat, with or with-

ENGLISH LIFEBOAT.

out air-chambers, which is used in broken water along the seashore for rescuing life, is known as a surf-boat.

The many supposed improvements that have been devised at one time or another for lifeboats, which have modified or departed from first principles, have generally resulted in no practical value, and there would be little advantage in considering them here. Neither would it serve any profitable purpose to go further back than the time of the origin of the present English model, even if that could be done with any degree of certainty. In 1785 Lionel Lukin, a coach-maker of an inland town near London, put afloat on the Thames a Norway yawl, which he had fitted with water-tight compartments, a heavy iron keel, and other essentials in buoyancy and stability, which are the cardinal and requisite features of the lifeboat of to-day. Lukin did not succeed in bringing his invention, which had many defects, into particular notice up to the time of his death, which occurred in 1834. An expert boat-builder of South Shields, Henry Greathead, however, put Lukin's device into practical use as early as 1790, when he produced a boat embodying the elements of the original, but with a curved keel and the substitution of cork for side air-chambers. This boat had no means of freeing itself of water, or of self-righting in case of being capsized. James Beeching, of Great Yarmouth, was really the first person to project a self-righting lifeboat, which he did in 1851, the design subsequently being bettered by James Peake, who added to it the self-bailing quality. This boat has since been much improved by study and experiment.



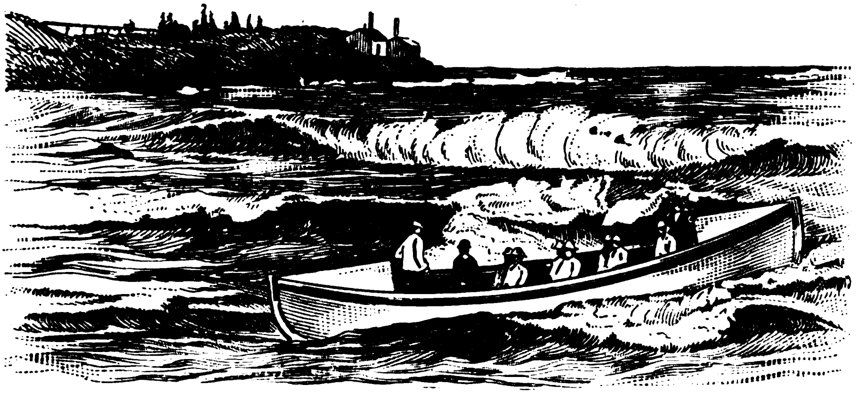
DECK PLAN OF A SELF-RIGHTING LIFEBOAT, SHOWING THE MANNER IN WHICH THE GEAR IS STOWED.

List of articles shown: 1, Anchor; 2, cable; 3, bow heaving-line or grapnel rope and grapnel; 4, drogue rope; 5, stern heaving-line; 6 and 7, veering-lines; 8, jib outhaul or tack; 9, mizzen sheets; 10, drogue; 11, life buoy; 12, loaded cane, heaving-line, and tub; 13, tailed block; 14, pump-well hatch; 15 and 16, deck ventilating hatches; 17, footboards for rowers; 18, side air cases; 19, relieving tubes and valves; 20, Samson post; 21, thwarts; 22, central batten, to which the masts and boat-hooks are lashed.

The chief requirement of the English lifeboat is to counteract, as far as practicable, the tendency of the boat to swamp when it ships a sea, and to remain bottom up when capsized. It therefore must possess extra buoyancy, stability, self-bailing and self-righting qualities. Boats in general use are about 34 feet long and have an extreme breadth of 8 feet. The frames are made of white oak, and the outside planking of Honduras mahogany, laid diagonally. To render the craft buoyant and insubmergible, large air-tight boxes are built in at both ends, and copper air-cases are placed under a water-tight deck, and along the sides of the boat above the deck and beneath the thwarts. The discharge of water is accomplished by means of 10 draining-tubes extending from the deck, which is on a level with the load water-line, to the bottom of the boat, the top of each tube being fitted with a self-acting valve, which opens downward when there is pressure from above and permits the water to flow out, but prevents it from entering from the opposite direction. The water on the raised deck, being above the outside level of the sea, by the force of its own gravity passes through the valves into the relieving tubes and escapes. A heavy gun-metal keel, three inches deep, is secured to the wooden keel of the boat, and this, in conjunction with the air-chambers, effects the self-righting property. The craft, when bottom up, floats unsteadily on the bow and stern compartments, while the keel, being carried above the centre of gravity, falls on one side or the other and drags the boat back to its natural, upright position, the water that has been shipped in the process passing out through the tubes. A lifeboat has usually five thwarts, which can accommodate 10 oarsmen, double banked, is fitted with a centreboard, and provided with movable masts and sails. Attached to the exterior sides are festooned life-lines to which persons may cling until they can be got into the boat. Owing to its great weight, some 4000 or 5000 pounds, this lifeboat can only be used to advantage along steep shores or where it can be launched directly into deep water. It is very useful in going long distances in rough water under sail. When the boat is kept on shore a carriage is furnished for transporting and launching it, while portable roller skids are also supplied to aid, when required, in its conveyance over the ground. The equipments, which are very complete, are carefully stowed in the boat always ready for immediate service.

The American lifeboat, extensively used on the ocean and lake coasts of the United States by the life-saving service, known as the Beebe-McLellan self-bailing boat, is entitled to rank next to the English production in exceptional qualities, and in some respects it is superior to the latter in all-around work. The makers have applied the self-bailing principle to a convenient model of light weight, about 1000 pounds, which can be transported and launched almost anywhere with ease and celerity, and whose liability to capsize is greatly diminished by reason of its ability quickly to free itself of water. It is a cedar, clinker-built boat, from 25 to 27 feet long, about 7 feet in breadth, with 4 thwarts, a centreboard or none, as desired, and is fitted with air-tanks and delivery-tubes. Its light weight, as compared with the cumbersome English lifeboat, is of material advantage to boatmen in American waters, while the self-bailing feature gives confidence to those who handle the craft in rough surf where the chief danger lies in being swamped by a boarding sea. The boat is rigged with righting lines, to be used in case of an upset, and is otherwise equipped for all emergencies. It can be carried on shipboard with little trouble.

The United States life-saving service has recently made experiments in applying motive power to the 34-foot lifeboat by installing a 12-horse-power gas-engine, and the gears and attachments of two propeller shafts, in the after air-chamber of the boat, the only parts of the machine on the outside of the bulkhead being the reversing levers, starting crank, and oil-cups. The gasoline and batteries are stored in the forward air-chamber. The construction of the boat is not disturbed in any particular, nor the self-righting qualities impaired. In the event of a capsize the engine stops automatically, and, owing to its inclosure in the water-tight compartment, suffers no damage or derangement. A uniform speed of seven and one-half miles an hour has been attained by the introduction of this power, which is meant to be auxiliary, and there is promise that it will prove of great value when generally adopted. For years efforts have been made to produce a successful steam lifeboat, of a convenient size, but thus far without satisfactory results.



UNITED STATES POWER LIFEBOAT.

There are many other types of boats designed for saving life, the greater number being for use on merchant ships. The characteristics deemed most essential in these are lightness, buoyancy, and seaworthiness. What is known as the New England whaleboat, long, rather narrow, sharp at both ends, and steered with an oar, is much favored by seamen. Collapsible boats of various patterns, which occupy little space when not in use, those invented by Berthon being among the best, are likewise employed, as well as ordinary metallic boats, the latter being less liable to injury when exposed to undue heat and moisture. See LIFE-SAVING SERVICE, and kindred articles.

LIFE BUOY. A float intended to support persons who have fallen into the water until other assistance can reach them. Those in common use are large rings of cork-stuffed canvas, each about 30 inches in diameter with a life-line looped to the outer side. The wearer gets within the ring, with his arms thereon, and is sustained. These buoys are usually kept at convenient places on shipboard, wharves, etc., where they may be readily detached and thrown to any one in danger of drowning. More elaborate buoys of the circular type, used in the navy and merchant marine, are fitted with markers, so that they may be easily seen when afloat, or with lights which ignite upon contact with the water or by an automatic device as they are released from their places. Life buoys are also constructed of rubber tubing, inflated, but these are liable to damage by being punctured or torn, or are apt to decay prematurely. A buoy, with an opening in the ring, shaped like a horseshoe, has been found to answer its purpose very well. See LIFE-SAVING SERVICE.

LIFE ESTATE. In the common-law system of England and the United States, an estate in land for the life of the tenant or of another. In quality the life estate is a *freehold*, and, therefore, of more importance than any leasehold, however long; but in point of quantity, or duration, it is rated as inferior to the freeholds of inheritance, viz. the fee simple and the fee tail. Historically considered, however, it is of more importance than any of these, being the original form of the fee, or feud, and the most characteristic form of feudal tenure of land. See FEE.

The ordinary classification divides life estates into the 'conventional,' or such as arise by agreement (*conventio*), and the 'legal,' or such as arise by operation of law. The ordinary life estate, created at common law by livery of seisin, and to-day by deed or will, belongs to the former class. The latter includes the matrimonial estates, curtesy, and dower (qq.v.), and a form of fee-tail estate which is no longer capable of inheritance, technically called 'fee tail after possibility of issue extinct.' But, however created, the qualities and incidents of life estates are the same. They come to an end abruptly on the termination of the life or lives by which they are measured, leaving no interest to descend to the heir of the life tenant or to pass to his devisees under his will. Being in quantity, or duration, less than the fee out of which (as the expression is) they are 'carved,' the land does not go to the State by escheat, but returns to the holder of the fee simple as a reversion or remainder (qq.v.). Though a freeholder, the tenant for life is liable for waste committed by him on the premises, and is subject to an obligation of fidelity to his landlord, the reversioner, or to his remainderman. A breach of this obligation, as by making a wrongful conveyance of the premises in fee simple by feoffment, involved a forfeiture of the life estate to the injured landlord. This characteristic of the estate has recently disappeared with the abolition of feoffment and other 'tortious conveyances.' See FEOFFMENT; FORFEITURE.

Subject to his liability for waste, the life tenant has many of the rights of an owner of the land. He might at common law protect his possession by the same ancient and exclusive remedies as were available to the tenant in fee simple. His estate is regarded as real property, and not, like a leasehold, however long, as personal estate. He is entitled to estovers (i.e. wood for fuel and repairs, and the like) and his personal representatives are, after his death, entitled to the emblements, or growing crops. (See EMBLEMENT; ESTOVER.) He may, by the methods appropriate for the conveyance of freeholds (livery of seisin, deed), freely alienate his estate, though he cannot in general give an estate to endure beyond his own. It is not uncommon, however, in creating a life estate, to confer upon the life tenant a power to lease the premises for twenty-one years or other determinate period, and a lease so made holds good notwithstanding the prior termination of the life estate. In England, where life estates are frequently created as an incident of marriage settlements for providing a revenue for the parties to the marriage and their issue, it has been provided by statute that such a life tenant may make long leases not subject to the life estate. (Settled Land Acts, 1882, 1890.)

An estate for the life of another than the tenant himself (still known by its Norman-French description as an estate *pour auter vie*) may arise either directly, as by a grant of land to A for the life of B, or indirectly through a conveyance by a life tenant of his life estate to another. In neither of these cases does the estate come to an end upon the death of the tenant *pour auter vie*, the person by whose life the estate is measured (known as the *cestui que vie*) being still alive. In that case there is an unexpired fragment of the life estate remaining, which, at the common law, vested in the first person to take possession thereof (known as the 'general occupant') or in a person designated by the creator or the tenant of the life estate (known as the 'special occupant'). This remnant of an estate *pour auter vie* is now generally disposed of by statute, going either to the heir or to the personal representative of the life tenant. See OCCUPANCY. See also ESTATE; FEE; TENURE, and authorities referred to under REAL PROPERTY.

LIFE GUARDS. The First and Second Regiments of Life Guards are cavalry regiments of the British Household Cavalry, and are stationed at Windsor and Regent's Park, London, respectively. They are the senior regiments of the Household Brigade, and being the personal regiments of the sovereign, are not required to go on foreign service. This rule, however, has been broken in every great campaign in which, since their organization, England has been engaged; notably in the Peninsular campaign and at Waterloo, where they particularly distinguished themselves. They had their origin in two troops of horse grenadiers, raised respectively in 1693 and 1702, which were reorganized in 1783 as regiments of life guards. They are armed with sword and carbine; mounted on heavy black chargers; and wear a uniform consisting of white leather breeches, knee-boots, red coat, steel helmet and cuirass, the former surmounted by a high plume. The rank and file are required to be over six feet in height before enlistment. In time of peace they are more or less occupied in the performance of duties about the Court and metropolis.

LIFE INSURANCE. Life insurance is a term used to cover a variety of transactions in all of which the uncertainty of human life plays a more or less important part. In its purest form a life-insurance contract contains an agreement on the part of the insurer to pay a stated sum upon the death of the insured, if that event occurs while the policy is in force. In recent years, however, the investment principle has come to be quite as prominent in life underwriting as the insurance principle, and through the combination of the two principles there has developed the great variety of policies now written by life-insurance companies.

HISTORY. Originally life insurance was not much more than an incident of marine insurance. When the success or failure of a voyage depended largely on the personal qualities of the master of the ship, the owners of ship and cargo would insure themselves not only against the perils of the deep, but also against the danger of loss through the death of the master; that is, they took out insurance on the life of the master for the voyage. These early life-insurance policies were written by individuals long before life-insurance companies came into existence. The earliest policy of which anything definite is known was issued in London in 1583, insuring the life of one William Gybbons for twelve months. This was underwritten by thirteen persons acting individually; the premium was $80 per thousand.

The earliest life-insurance company of which we have definite information was established in 1699 by the Mercers' Company of London for the benefit of the widows and orphans of subscribers. The members of the company bound themselves to pay five shillings apiece to constitute an indemnity to be paid on the death of each member. The oldest existing life-insurance companies are the London Assurance Corporation and the Royal Exchange Assurance Corporation, both of which were chartered in 1720, and began to issue life policies in 1721. The Equitable, established in 1762, was the first office to devote itself exclusively to the business of life insurance, and to make use of the scientific methods which characterize modern underwriting. The only other surviving English society which has come down from the eighteenth century is the Pelican, which was founded in 1797.

The first life-insurance society established in the United States was incorporated in Philadelphia in 1759. It was called the Presbyterian Annuity and Life Insurance Company. This company still exists, having amended its charter in 1875 and changed its name to the Presbyterian Ministers' Fund Life Insurance Company. Two other similar societies were established in the eighteenth century, one in Philadelphia in 1769 for the relief of widows and children of clergymen of the Church of England in America, the other in New Jersey in 1784, for the benefit of the Episcopal clergy of that State. The first general life company, the Pennsylvania Company for Insurances upon Lives and Granting Annuities, was chartered in Philadelphia in 1812. In 1818 was organized the first Massachusetts company, known as the Massachusetts Hospital Life Insurance Company. A number of other companies were chartered during the next twenty years in the several states, many of them combining the business of a trust company with that of an insurance company, but the amount of life insurance written was very small. It was not until the early forties that the movement really began to assume large proportions. Between 1840 and 1850 several of the most prominent of existing life-insurance companies were established, including the Mutual Life of New York (1842), the State Mutual of Worcester (1844), the Nautilus Insurance Company, now the New York Life, of New York (1845), the Connecticut Mutual of Hartford (1846), and the Pennsylvania Mutual of Philadelphia (1847).

After the Civil War a large number of new companies entered the field, and a period of intense competiton followed. The resulting laxity in the inspection of risks and great expenses of management led many of the newer and less conservative companies into financial difficulties. During the decade following 1870 a considerable number of companies failed and many others reinsured their risks and were forced to retire from business. This aroused a hitherto unknown feeling of distrust in the minds of the people, and caused a falling off in the amount of business, from which the companies were fifteen years in recovering. The seriousness of the decline during this period is shown by the following statistics of the insurance in force in companies reporting to the New York Insurance Department: 1870, $2,023,000,000; 1875, $1,922,000,000; 1880, $1,524,000,000; 1885, $2,023,000,000. During the same years the number of companies who reported to the New York Department fell from seventy-one to thirty. Since 1880 the growth of the business in the United States has been steady and apid. According to the New York report for 906 there was insurance in force December 31, 05, amounting to $10,553,839,955. At the same me there were industrial and other policies in rce carrying $2,212,800,821.

A very large proportion of the life insurance in ce in the United States is in the hands of panies making reports to the New York State Insurance Department. The extraordinary growth of the business since 1880 may be perceived from the following table, compiled from these reports:

LIFE INSURANCE IN THE UNITED STATES

YEAR	No. of Cos.	No. of policies	Insurance in force	Assets	Surplus
1880	30	608,681	$1,475,995,172	$417,951,009	$71,561,669
1885	29	814,691	2,023,517,488	523,664,678	92,749,486
1890	30	1,272,895	3,542,965,751	753,228,759	88,739,362*
1895 †	35	1,877,808	4,818,170,945	1,142,419,926	159,750,174
1900	40	3,071,253	6,947,096,609	1,723,737,723	158,277,942
1905	43	5,306,161	10,553,839,955	2,651,316,714	362,357,798‡

* The apparent decrease of surplus in 1890 was due to the change from the American Mortality Table at 4½ per cent. interest to the Actuaries' Table with 4 per cent. interest.

† In 1895 and later years assets and surplus of companies transacting principally or solely industrial insurance appear in the table. Number of policies and amount of insurance in force are exclusive of industrial insurance.

‡ The extraordinary increase in surplus in 1905 was due to including items not included before 1901.

TECHNIQUE. The principles by which premium rates are determined in life insurance are few and simple, though the practical application of the principles involves elaborate mathematical calculations and formulæ. The attempt here is to bring out clearly the nature of the fundamental principles. Any one desiring to investigate the mathematical side of the subject will find abundant material in *The Principles and Practice of Life Insurance* (6th ed., New York, 1892).

The uncertain element in life insurance is the duration of the life of the insured. As it is impossible to determine the length of life of an individual by the closest examination to which he can be subjected, it becomes necessary to resort to the indirect method of determining probabilities by applying the laws of probability to the data of experience. The probabilities of the future are based on the experience of the past. So far as the duration of human life is concerned the results of past experience are summarized in life or mortality tables.

MORTALITY TABLES. The discussion of the general subject of mortality tables will be found in the article on VITAL STATISTICS. We shall note only a few tables which have been in general use among life-insurance companies. The early policies were for short periods, and rates were based rather on guesswork than on any definite notion of the actual risk assumed. The premium rates were accordingly high and were independent of the age of the insured. The Amicable of England, which worked on the assessment plan, continued as late as 1807 to make uniform assessments on all ages, partially protecting itself by admitting to membership only persons between twelve and forty-five inclusive. When the more exact calculation of risks was attempted the early English companies relied chiefly on tables prepared by Halley (1693) and Süssmilch (1741). Afterwards the Northampton table came into general use. This was prepared by Dr. Thomas Price from the registers kept in the parish at Northampton for the years 1735 to 1785. The Northampton table was later superseded by the Carlisle table. This was prepared by Joshua Milne about 1815 on the basis of two classes of statistics, enumerations of the population of two parishes of Carlisle in 1780 and 1787, and the records of deaths in the two parishes for the years 1779 to 1787. Although the data on which the table was based were very scanty, the total number of deaths, for example, being only 1840, they were worked over with so much care that the results were much more accurate than those embodied in the Northampton table. The Carlisle table is still used by some English companies.

All the tables thus far referred to, as well as others of the same period, were based on the life experience of the general population. The first table which took account only of insured lives was based on the experience of the Equitable Assurance Society and was published in 1825. Comparatively little use has been made of this table, but a similar table, based on the combined experience of seventeen English life-insurance offices and published in 1843, is still used by many English companies, and is the authorized table for the calculation of reserves in most American States. It is variously known as the Actuaries' Table, the Combined Experience Table, and the Seventeen Offices' Table. A similar table prepared under the direction of the Institute of Actuaries from the experience of twenty English and Scotch companies was published in 1869. This table is tending to supplant both the Carlisle and the Combined Experience table in British offices, but has not been officially recognized in any American State.

The early American offices adopted English tables, first the Northampton, later the Carlisle, more recently the Actuaries' or Combined Experience tables. Meantime several tables based on American experience have been worked out, but none of them has come into general use except the so-called 'American Experience' table. This was constructed by Mr. Homans from the experience of the Mutual Life Insurance Company of New York. More elaborate tables have since been worked out, based on the experience of thirty American offices. These deal separately with male and female lives, and correlate mortality with place of residence, with cause of death, and with other phenomena. They furnish the material for much more accurate classification of risks in life insurance than is now attempted, but no company has seen fit to adopt a schedule of premium rates based on the new information. At the present time the two tables in general use among insurance offices in the United States, and authorized by the insurance departments of the various States for the calculation of reserves, are the English Combined Experience table and the American Experience table. The following tables show the number surviving at the end of ten-year periods out of 1000 living at age ten according to the different tables mentioned above. For purposes of comparison data have been added from the mortality table recommended by a recent session of the National Fraternal Congress for the use of fraternal beneficiary societies. This table starts with age twenty, and not with age ten, as the other tables do. In order to make a ready comparison possible, the Fraternal table as here given assumes 925 living at age twenty.

Both the Actuaries' and the American tables are known to be too favorable to the insurance companies, that is, to indicate a higher death-rate than actually prevails, and neither of them makes any attempt to classify risks according to any other factor than the age of the insured. Moreover, the numbers for the advanced ages are based almost entirely on *a priori* principles, and not on actual observation, since historical data for those ages are very incomplete. The older insurance companies, which have done a large whole-life business, such as the Presbyterian Ministers' Fund, the New England Mutual, and the Connecticut Mutual, show a heavy saving over the Actuaries' tables in the later as well as in the earlier years. The following figures are taken from the Actuaries' table of mortality, and will serve to show the character of a mortality table. The figures from age thirty to age ninety are here condensed in order to shorten the table. Other columns are often added, such as one giving the per cent. of deaths each year to the living at the beginning of the year, and one giving the expectation of life at each age.

ACTUARIES' TABLE OF MORTALITY

Age	Number living	Number dying	Age	Number living	Number dying	Age	Number living	Number dying
10	100,000	676	22	91,905	866	70	35,837	22,547
11	99,324	674	23	91,219	690	80	13,290	11,971
12	98,650	672	24	90,529	694	90	1,319	427
13	97,978	671	25	89,835	698	91	892	322
14	97,307	671	26	89,137	703	92	570	231
15	96,636	671	27	88,434	708	93	339	155
16	95,965	672	28	87,726	714	94	184	95
17	95,293	673	29	87,012	720	95	89	52
18	94,620	675	30	86,292	7,639	96	37	24
19	93,945	677	40	78,653	9,136	97	13	9
20	93,268	680	50	69,517	13,544	98	4	3
21	92,588	683	60	55,973	20,136	99	1	1

RATE OF DISCOUNT. Before passing to a consideration of the method of determining premium rates from the mortality tables, attention must be called to one other point. As nearly all life-insurance policies are for a number of years, and as during those years the insurance company is gradually accumulating a fund from the insured to be used in paying the indemnity when it becomes due, it is necessary to make allowance for the interest which the company will receive on these funds while they are in its possession. Even in the case of annual insurance, actuaries always assume that payments to the company are to be made at the beginning of the year, and payments by the company at the end of the year. In calculating premium rates, therefore, interest for one year on the premium is assumed.

Net premiums are the premiums based on the mortality tables alone, and are intended to cover merely the mortuary losses of the company. Actual premiums contain in addition an element

NUMBER SURVIVING AT DIFFERENT AGES ACCORDING TO DIFFERENT MORTALITY TABLES.

AGE	Northampton	Carlisle	Actuaries'	American	Fraternal
10	1,000	1,000	1,000	1,000	......
20	904	943	933	926	925
30	773	873	863	854	878
40	641	786	787	781	826
50	503	681	695	698	756
60	359	564	560	579	346
70	217	372	358	386	456
80	83	148	133	145	188
90	8	22	13	8	15

of 'loading' to cover expenses and to provide for contingencies. The loading is usually from 10 to 40 per cent. of the premium.

Calculation of Premiums. We are now prepared to investigate the method of determining net premium rates from the mortality table. We shall start with the simplest form of policy and proceed to the more complex forms. If a person at age twenty-five desires to insure his life for $1000 for one year, what premium ought he to pay? By consulting the mortality table we find that of 89,835 persons living at age twenty-five, 698 die within a year. The probability of death is therefore $\frac{698}{89835}$. The risk involved in insuring his life for $1000 for one year is therefore $1000 × $\frac{698}{89835}$, or $7.77. But the premium is paid at the beginning of the year, the indemnity at the end. It is therefore necessary to allow for the interest, say at 4 per cent., which the premium will earn during the year. This is done by discounting the $7.77 for one year at 4 per cent. We find the net premium to be $7.47. If the insurance is renewed at the close of the year the new premium is based on the probability of the death of the person at age twenty-six, and amounts to $7.58; and with every succeeding year the premium increases according to the increased probability of death. This method of paying for insurance is known as the natural premium plan.

The premium necessary to secure insurance for a number of years by a single payment at the beginning of the first year is determined in a similar manner. Thus to find the single premium for two years' insurance, discount the risk (the amount of insurance multiplied by the probability of death) for the first year at 4 per cent. simple discount for one year, and the risk for the second year at 4 per cent. compound discount for two years. The sum of the results is the single advanced premium for two years' insurance. By continuing the process the single premium for an insurance to run any stated number of years or even for life may be ascertained. Insurance limited to a stated number of years is known as term insurance.

In the great majority of cases term insurance is paid for by a uniform annual premium during the term of insurance. Such premium is known as a 'level' annual premium. Let us see how it would be determined for a two years' term. The two annual premiums must evidently have the same value to the company as the single advance premium, with proper allowance for the possibility that the insured will not be alive to pay the second premium. It is necessary, therefore, to find the present value of $1 to be paid at once and $1 paid a year from now if the insured is still living. To ascertain the latter amount we must first discount the dollar for one year at 4 per cent., and then multiply the result by the fraction whose numerator is the number living at the end of the year and whose denominator is the number living now. That fraction represents the probability that a person living now will be living a year from now; and the result of the whole process is the present value of the $1 payable a year from now, subject to the contingency of death during the year. If this amount is added to the dollar payable at the beginning of the first year the sum is the present value of the promise of the insured to pay a dollar in advance for two years if living. To find how many dollars in a level annual premium are equal in value to a single premium payable in advance, divide the single premium by the present value of $1 if living. The mathematical operation of finding the level annual premium for $1000 insurance for two years at age twenty-five follows:

Risk for first year, $7.77, discounted at 4 per cent. for one year	$7 47
Risk for second year, $7.887, discounted at 4 per cent. for two years	7 29
Single advance premium for two years' insurance	$14 76
Present value of $1 payable now	1 00
Present value of $1 payable one year from now, subject to the contingency of death $\left\{\frac{\$1.00}{\$1.04} \times \frac{89137}{89835}\right\}$ or	95
Present value of annual premium of $1 for two years	$1 95
Level annual premium, $14.76 ÷ $1.95, or	7 57

To find the level premium for three years' insurance, add to the $14.76 the risk of the third year discounted for three years at compound discount, and to the $1.95 the present worth of the contingent promise to pay $1 two years from now, and divide as before. To find that present worth, multiply the present value of $1 at 4 per cent. compound discount for two years by the fraction whose numerator is the number living at the beginning of the third year and whose denominator is the number living now. By continuing this process the net level annual premium for term insurance for any number of years will be found.

In the case of insurance to run for life there is apparently a new element introduced, since the indemnity is certain sooner or later to become a claim. But the difference is only in appearance. If the Actuaries' table be used, a whole-life policy taken out at age twenty-five may be treated as a term policy for seventy-four years, since the table assumes the death of the last survivor at ninety-nine. In calculating the risk for the seventy-fourth year the fraction representing the probability of death becomes unity, and the risk assumed for that year equals the face of the policy. This risk would then be discounted at 4 per cent. compound discount for seventy-four years, and the result added to results similarly obtained for previous years. On the other hand, the promise to pay $1 each year for life ceases to have any value after the seventy-fourth year, since on the seventy-fifth year the numerator of the fraction representing the probability of survival becomes zero.

Endowment insurance to-day is quite as much in evidence as pure life insurance. An endowment is a promise to pay a person a stated sum at a future day provided the person is living at that day. Endowment insurance usually provides also for the payment of an insurance indemnity if the insured dies before the end of the endowment period. The two transactions, however, the insurance and the endowment, are entirely distinct. In endowment insurance the premium contains two elements, one to pay for the endowment, the other to pay for the insurance. Let us consider how each is determined.

What risk does a company assume which promises a boy of ten that if he is alive at thirty it will pay him $1000? The table shows that the probability that he will survive is $\frac{86292}{100000}$. Multiplying $1000 by that fraction makes the risk $862.92. If we discount this amount at compound discount for twenty years, we have the present value of the risk, or the single advance premium equivalent to the risk. At 4 per cent. discount the result would be $393.82. To find the net annual level premium for the endowment, divide this single premium by the present value of the promise at age ten to pay $1 annually for twenty years contingent on surviving. The promise to pay $1000 if the insured dies before the end of the period is an insurance contract, for which the net single premium payable in advance, ascertained according to the method already described, is $92.75. This premium covers the chance of dying, as the endowment premium covers the chance of surviving. The net single premium for the endowment life-insurance policy is therefore $393.82 plus $92.75, or $486.57. The net annual level premium will be found by dividing this amount by the present value of the contingent promise to pay $1 annually for twenty years from age ten.

Limited-payment life policies grant insurance for life in return for a limited number of annual payments. The net single premium for such a policy might be ascertained by computing the present value of the risk assumed by the company as in the case of whole-life insurance, and the level annual premium might be ascertained by dividing this amount by the present value of the promise to pay $1 for a stated number of years of living. Or the risk may be divided into two parts, term insurance while the payments are going on, and life insurance after the end of the period of payments. The single premium for the term insurance would be found in the way already described. The single premium for the life insurance would then be found by calculating the single premium necessary to pay for an endowment to come due at the end of the limited-payment period and to be large enough to constitute a single premium for whole-life insurance at the age which the insured will then have reached. In whatever way the single premium is determined, the level premium will be ascertained by the usual method.

Keen competition for new business has led life-insurance companies to devise a bewildering variety of policies, embodying many different methods of settlement. It is unnecessary, however, to consider in detail these different forms. However complicated they may be, they can all be analyzed in such a way that the net premiums may be ascertained by the application of the same principles, namely, probability and discount.

Loading. In the matter of loading, however, there is room for great diversity. The loading is the addition to the net premium to cover contingencies and expenses of management. The contingencies to be prepared for are a rate of mortality in excess of that indicated by the mortality table in use, and a rate of interest below that assumed in discounting future payments. The larger part of the loading is for the purpose of meeting the expenses of management. The loading varies greatly in different kinds of policies. Where natural premium rates are used it is commonly 33⅓ per cent. of the net premium plus $4 per $1000. On term policies of all kinds it is 33⅓ per cent.; on whole-life policies it varies from 25 per cent. to 40 per cent., while for the endowment policy it is commonly 20 per cent. to 25 per cent. Of the gross premium, therefore, from 16⅔ per cent. to 30 per cent. is loading.

It is difficult to discuss in detail the expenses of life-insurance companies, but that they are excessive is the unanimous testimony of disinterested investigators. Greater expenses mean higher premiums, and higher premiums mean a smaller number of insured and a larger proportion of lapses and surrenders. The effort to secure new business leads to the adoption of more and more costly methods of solicitation rather than to a reliance on the attractive powers of low premiums. The item of commissions to agents represents over a half of the entire cost of management of the life-insurance business. In the first year of a policy the commissions encroach heavily on the net premium; for while the loading is from 16 per cent. to 20 per cent. of the gross premium, the commission to the agent has in recent years been more than 50 per cent. of the gross premium.

By the New York law of 1906, a step in the direction of reform was made by the provision limiting first-year agency commissions to the gross loading, and also restricting renewal commissions. While this provision places a handicap upon agents of those companies which by economical management have been able to reduce their loading, it will make it difficult for an insurance company to conceal from the policy-holders the exact cost of securing new business.

The cost of the agency system is not confined to the commissions paid to the agents. Allowance must be made for the extra-hazardous risks foisted upon the company through the desire of the agents for commissions, and for the enormous number of lapses by persons who either do not need insurance or cannot afford to carry it, but are induced to take it out through the persistence of the solicitors. More than half of the lapses occur before the second premium is paid, and according to the testimony of the companies themselves every such lapse represents a net loss to the company.

To the policy-holder there is of course an advantage in extending the business of the company in which he is insured up to the point where highest efficiency of management is attained, and to the point where the total number of insured is such as to come within the laws of average mortality. With only a small volume of business a company is handicapped in the making of investments, and in securing the best type of financial and business management; with a very limited number of insured, the possibilities of excessive mortality in any one year require the accumulation of a large surplus for security. But in most of the old-line insurance companies in America, the point of maximum efficiency has long since been passed. Under the circumstances new business is advantageous to those already insured—in whose interest the company is supposed to be managed—only when the returns from such business cover at least all expenses connected with it. Certain British companies, having attained a size permitting of maximum efficiency, have abandoned altogether the active solicitation for new business, accepting of course such business as may come unsolicited. These companies are able to give insurance at very low rates as compared with companies pursuing another policy. Most of the American companies, on the other hand, regard every increase in business, even though obtained at a cost entailing burdens upon those already insured, as something desirable in itself; and hence have shown greater and greater liberality in their commissions to agents to secure such business. For the same reason certain companies maintain foreign offices which every year represent a net loss to the company. This policy is defended on the ground that insurance confers such great advantages upon society that its benefits should be extended, even at a net cost to those who are now insured. Before the investigating commission of the New York Legislature in 1905 the president of one of the greatest companies defended the practice on the ground that life insurance was, in a measure, a philanthropic business. A better explanation of this apparent violation of business principles will appear when we consider the practical management of a life-insurance company.

From the large commissions paid to agents from the gross first-year premium has sprung the practice of rebating. Officials in the employ of the insurance companies have been permitted by the companies to retain all or part of the agents' commission upon insurance taken out by themselves, members of their families, and even their friends. Agents anxious to secure, for advertising purposes, the patronage of persons prominent in a community often gave rebates representing a large part of the commission. The net effect was to give to persons of power and influence insurance at cheaper rates than persons having no special advantages enjoyed; and in the end, to increase the amount of premium paid by the latter class. The practice was prohibited in New York State by the law of 1906.

Medical Examination. The early mortality tables were constructed on the basis of the mortality of the general population. In the absence of restrictions it is obvious that insurance companies would suffer from an unfavorable selection of risks. The unhealthy and the weak would seek the benefits of insurance, while the strong and healthy would make comparatively little use of it. To avoid such unfavorable selection, insurance companies endeavor to limit their operations to persons of average expectation of life, and to bar out those below the average. In the beginning, therefore, insured lives are a selected class, and might be expected to show a death-rate considerably below the average for the general population. It is commonly claimed, however, that through the tendency of the stronger to surrender their insurance readily and of the weaker to keep theirs up as long as possible, the entire benefit of the original selection is lost within five or six years.

The original selection of risks was made chiefly on the results of the medical examination. The medical examiner is required to ascertain from the applicant personally all needed facts relating to family and personal history, as well as to present physical condition and evidences of past disease. and also to judge of the risk. Among the facts to be elicited are the following: age and occupation, residence; whether or not he has been rejected or postponed because of illness or risk; use of liquors and of tobacco; service in army or navy, or rejection by recruiting officer; height and weight; race and sex; presence of hernia, or results of accident or injury; hereditary influences, as inferred from age and condition of health of parents and of four grandparents, if still alive or at time of death, with cause of death in each case; similar facts regarding brothers and sisters; existence of pulmonary tuberculosis or insanity in any part of family; all diseases from which applicant has suffered, with date, duration, severity, and result in each case, as well as name of attending physician; present condition of physical health and evidence of tendencies toward disease. Moral hazard must be considered as well as physical condition. From this information the examiner is asked to judge of the risk as a partial guide for the medical director.

Termination of Policies. There are five ways in which life-insurance policies may be terminated: by maturity, by death, by expiry, by lapse, or by surrender. The method of settling endowment policies at maturity is simple and presents few points of interest. The payment of death claims is hedged about with more formality. Formerly companies were disposed to take advantage of technicalities in order to avoid paying claims, but now reputable companies show commendable willingness to settle on receipt of proofs of death. In the nature of things the chief reliance for such proof is on medical testimony.

Lapses and Surrenders. A policy is said to lapse when the insured fails to pay a premium at the stipulated time. A policy is surrendered when the insured gives formal notice to the company of his desire to terminate the policy and receive its surrender value. The proportion of policies surrendered or allowed to lapse is very large. During the decade 1891-1900 the regular life-insurance companies reporting continuously to the New York Insurance Department issued policies on which the first premiums were actually paid which carried insurance to the amount of seven and three-fourths billions of dollars; during the same decade they wrote off their books more than five billions of dollars. The amount terminated by lapse or surrender during the decade exceeded three and one-half billions of dollars. In 1905 the amount terminated in regular ways was $324,000,000, while $644,000,000 were terminated by lapse or surrender. The blame for this unfortunate state of things rests upon the commission-seeking agents. Further evidence of their excessive zeal is seen in the fact that of the total amount of insurance written by the companies considerably more than 10 per cent. is never issued because the applicants fail to pay even the first premiums.

Surplus and Reserve. If all insurance were pure insurance without any endowment element, and if it were always paid for on a natural-premium plan, and if, further, the actual mortality were exactly equal to the assumed mortality, and the actual interest rate equal to the assumed rate, the question of lapses and surrenders would have comparatively little significance. Under such conditions the premium for each year would pay for the insurance of that year, and if the insured allowed his policy to lapse he would already have received in the form of protection the equivalent of the premiums he had paid in. But even on the natural-premium method the premiums must contain an element of loading intended to cover expenses and contingencies. It is clearly neither practicable nor desirable to estimate the loading so closely that there shall never be any excess. Furthermore, it would not be practicable for a company to calculate mortality so closely that the number of assumed losses would never be less than the number of actual losses. The advance premiums covering insurance for a single year create a fund which will be invested at interest. It would also be impracticable to calculate interest at exactly the figure that will be earned. A surplus arising from these three sources would frequently be left in the hands of the company, even upon the natural-premium plan, and with the companies free to calculate mortality and interest according to any plan they might choose.

In the States which regulate insurance companies with any degree of efficiency the mortality rates and the interest rates to be assumed in calculating net premiums are prescribed by law. The Actuaries' and the Combined Experience mortality tables are the ones commonly prescribed for calculating mortality; while the prescribed interest rate varies from 3½ per cent. to 4½ per cent. Through selection of risks any company can keep the actual mortality rate below the assumed rate. In 1903 the gain accruing to twenty-four of the chief companies from this source exceeded $20,000,000. Moreover, any company, by careful investment, is able to earn more than the assumed rate of interest. In 1903 every one of the twenty-four companies did this; indeed, the actual rate for all the companies was 122 per cent. of the requirement, and the total gain accruing to the companies from this source exceeded $10,000,000. The loading for all the companies exceeded slightly the actual expenses it was designed to cover. From all these sources, then, a very considerable surplus must accrue to every well-managed company.

If the company is organized on the joint-stock plan, this surplus is clearly the property of the stockholders, unless, of course, the policies written give the insured certain claims upon it. In a mutual company it is the property of the policy-holders. Since the surplus is so important an item, it would be difficult for stock companies to compete with mutual companies unless the policy-holder were assured a part of the surplus in one company as in another. Hence, in practice some form of "dividends" are promised the policy-holder—unless he prefers a "nonparticipating" policy, in which case he is insured at a lower rate.

In the determination of dividends to each policy-holder many knotty problems arise. Theoretically, each policy-holder should receive in dividends exactly what his payments have contributed to the surplus. But this is something very difficult to ascertain in practice. In the United States what is known as the "contribution plan" of apportionment has enjoyed wide popularity. If the mortality has not been so high as assumed, the policy-holder receives a rebate on his own estimated cost of insurance; if interest is higher than assumed, he is given a sum representing the excess of interest on the reserve on his own policy; if savings in expenses leave a surplus from loading, the policy-holder receives a rebate proportioned to the loading on his own policy. This method, however, is open to the objection that the average savings on mortality for the whole number of insured may not accurately represent the savings on mortality for any class of lives; similarly the surplus from loading may not arise equally from all classes of policies, It was admitted by a high insurance official before the New York investigating commission in 1905 that the determination of dividends was largely a matter of guesswork.

In the form of distribution practice differs widely. In England a popular method is to use the dividend to buy paid-up insurance. In the United States cash payments are the rule, either on the annual dividend or the deferred dividend plans. By the latter plan no dividend is actually declared until a certain period—5, 10, 20 years—has elapsed, although dividends may be computed annually on each policy, and the policy-holder may be given an account of such dividends set aside for him. By the deferred dividend plan, the policy-holder who surrenders his policy forfeits, as a rule, all claim to the dividends; and the same thing is true of those who die before the end of the dividend period. The forfeited dividends go to swell the dividends of those who remain in the company at the end of the dividend period. The advantages to those who survive are obvious. They receive a far larger part of the surplus than they have actually contributed. The hope of receiving this return is supposed to operate as a check upon withdrawals. The disadvantages of the plan are (1) its unfairness to the insured who surrender their policies or die before the end of the term; (2) the removal of the check upon the management of the company which is afforded by an annual accounting. The policy-holder under the deferred dividend plan cannot know what his reserve is earning; he cannot compare the results of his policy with those of policies offered by other companies. By the New York law of 1906 deferred dividend policies were abolished for new business in the State.

The questions relating to the rights of the policy-holder become still more important in connection with the reserve fund. Whenever level premiums are substituted for natural premiums, a reserve must be accumulated out of the excess of the early payments to make good the deficiency of the later payments. Whenever insurance is paid for more than a year in advance, as in case of single-payment or limited-payment life policies, a reserve must be accumulated to cover the cost of insurance for the years after the premiums cease. For an endowment a reserve is necessary which at the end of the endowment period shall be sufficient to meet the maturing obligations.

The insured stands in his relation to the reserve in a position quite different from his relation to the surplus. Whether a person is insured in a mutual company or a stock company, he clearly has an equitable title to his reserve as long as the insurance is in force. When the policy terminates naturally, by death, by maturity, or by expiry, the reserve is used for the benefit of the policy-holder according to the terms of the insurance contract. When the policy lapses, on the other hand, the question arises as to what disposition shall be made of the reserve.

NON-FORFEITURE LAWS. Down to the middle of the last century a policy-holder who allowed his policy to lapse forfeited both surplus and reserve. At that time most of the insurance was term or straight life insurance, and the question of reserve was comparatively unimportant, and not at all understood by the insuring public. It was in the case of limited-payment policies and endowment policies that the policy-holders came to see clearly that they had rights in the matter. If ten or twenty annual payments are to be enough to enable an insurance company not only to grant insurance during the ten or twenty years, but also to give paid-up insurance for life or to pay an endowment at the end of the period, evidently when one-half the payments have been made the insured has purchased some part of his endowment or paid-up insurance. In the last half of the century both legislation and competition worked in favor of the lapsing policy-holder. The first legislative recognition of the right of the insured to the reserve on his own policy was the law passed by the Massachusetts Legislature in 1861. This law required that, in case a premium should not be paid when due, the net value of the policy should be ascertained according to the combined experience or actuaries' rate of mortality, with interest at 4 per cent. After deducting from such net value any indebtedness to the company which the insured might have incurred, 80 per cent. of the remainder should be employed as a single net premium of temporary insurance, the amount of insurance to be the same as that of the original policy, and the term for which it should run to be determined according to the age of the insured at the lapse of premiums, and the assumptions of the mortality tables and interest rate prescribed in the act. By a law of 1880 it was provided that when two full annual premiums had been paid in cash or note, or both, upon default in a subsequent payment, the full net value of the policy, after deducting indebtedness to the company, should be used as a single premium for life or endowment, to buy paid-up insurance. This paid-up insurance was to terminate at the same time as the original policy.

California, Maine, Michigan, Missouri, New Jersey, and New York have since passed similar non-forfeiture laws. Massachusetts and Missouri exempt from the operation of the non-forfeiture law those policies which are allowed to lapse before two annual payments have been made; in the other States the law does not apply unless three premiums have been paid. Non-forfeiture laws have now become unimportant, since the companies voluntarily offer as good terms as legislation would be apt to secure.

TONTINES. Progress in this direction, however, has not been uniform. It was interrupted for a time by the great popularity of the tontine system of insurance. Under this system the surplus and reserve of lapsing policy-holders were by the insurance contract surrendered to the company, but instead of becoming the property of the company, the agreement was that they should be divided at the end of the 'tontine period' among those of the insured who still survived. Under such a plan the more lapses there are the greater is the gain to those who survive. The insurance companies were glad to encourage the practice, because tontine policies were attractive to the very class of lives that they are most anxious to insure, the lives of the strong and healthy. The use of the pure tontine policy has now been almost entirely abandoned, partly because the tontine gains were disappointingly small in prosperous times and with an especially select class of lives, partly on account of adverse legislation.

SURRENDER PRIVILEGES. The Massachusetts non-forfeiture laws, described above, illustrate two of the modes of settlement of the claims of lapsed policy-holders, namely, extended insurance and paid-up insurance. A third method of settlement consists in cash payment. Under extended insurance the reserve is used to continue the original policy in force as long as it suffices to pay the premiums, and in many companies the insured are allowed to reinstate their policies by making good the unpaid back premiums with interest at any time before the reserve has been exhausted.

CONTROL OF LIFE-INSURANCE COMPANIES. The control of a mutual life-insurance company rests, in last analysis, with the policy-holders; that of a joint-stock company with the stockholders. But it is generally recognized that the life insurance business is essentially mutual. Until 1906 the control of the hundreds of millions of assets of the Equitable, the largest joint-stock life-insurance company in the world, vested in the holders of the $100,000 of capital stock. By a plan put into operation in 1906 policy-holders have the right to elect a majority of the directors of the Equitable by voluntary action of the stockholders, in response to the demands of public opinion.

Immediate control of an insurance company rests in a board of directors, elected by the stockholders in a joint-stock company, by the policy-holders in a mutual company, and by both classes in a 'mixed' mutual and stock company. As the policy-holders are widely scattered, and in any case consist largely of persons who have neither the inclination nor the opportunity to acquaint themselves with the management of the business, they are compelled to vote by proxy. In many cases enough proxies to control elections are entrusted to the president and other officers, who can thus determine the composition of the board of directors. Under the circumstances the trustees can have little real control over the president and other high officers whom they are supposed to appoint.

In some cases proxies have been given for long periods—even in perpetuity. In the insurance investigations in 1905 the fact was disclosed that in one New Jersey Company proxies sufficient for control under ordinary conditions had been held by the president of the company.

One result of the virtual control of the company by the administrative officers, arising out of the proxy system, has been the payment of inordinate salaries to the higher administrative officers. Thus in 1905 the salary of the president of the Mutual Life was $150,000 per annum; that of his son, the general manager, $121,766. The president of the New York Life received a salary of $100,000. This tendency has been no less striking in joint-stock companies. An investigating committee of the directors of the Equitable, in 1905, reported that the salary of the first vice-president of the company had been increased from $30,000 in 1900 to $100,000 in 1905, although there was nothing to justify such increase. The salaries of thirteen executive officials of the same company had been increased from an aggregate of $297,600 in 1900 to $448,500 in 1905. Under either the mutual or the joint-stock plan, the control tended to centralization in the hands of a few managing officials.

In order to bring the management of mutual life-insurance companies under the control of the policy-holders, the New York Legislature enacted in 1906 a law requiring the removal of the existing directorates of New York mutual companies, and the election of new boards, invalidating all existing proxies and limiting the validity of new proxies to two months, and prescribing in detail methods of voting in person, by mail, and by proxy. The law also required that the lists of policy-holders should be accessible to any policy-holder. The law further contained provisions for facilitating the transformation of existing joint-stock companies into mutual companies.

While frequent changes in management are undesirable, and annual struggles for the control of a company, like that carried on in 1906 between the existing management and the "International Policy-holders' Committee," for the control of the New York Life and the Mutual tend to impair public confidence in the companies, it is generally believed that as a rule the management will have sufficient advantages in proxy-getting to continue itself in power, so long as its policy is generally approved.

INVESTMENTS OF LIFE-INSURANCE COMPANIES. The reserves and surplus of the life-insurance companies represent capital for investment exceeding two and a half billions of dollars for the companies reporting to the New York insurance department. These funds are specially adapted for permanent investment, since under ordinary conditions, with the business of the company remaining stationary, the income from premiums and investments is at least equal to all the expenditures. The fundamental requirements of all investments of life-insurance companies are: (1) security of the principal; (2) certainty of income; and (3) the highest income compatible with these requirements. Other things being equal, the higher the interest return, the lower will premiums need to be, or the higher the dividends.

Mortgages on small holdings of improved real estate, restricted to a limited proportion of the value of the property, meet the above requirements admirably. If due care is exercised by the company in making such loans, they are among the most secure and profitable of investments. The expense of administering such assets is, however, considerable; and the business would become unwieldy with large companies. Real estate itself, as it continually fluctuates in value, is a doubtful form of investment.

The bonds of municipalities in States where municipal corporations are carefully restricted as to their debt-incurring powers form an investment which is secure, easily administered, and profitable. State bonds may be very satisfactory, but the possibility of repudiation exists.

Loans to policy-holders upon their own policies, the amount of the loan being restricted to the reserve on the policy, is a perfectly safe investment for the insurance company, and yields a return above the average. Such loans form a considerable part of the investments of most companies.

A somewhat similar form of investment consists of advances to agents upon renewal commissions. A common form of agents' contract, before 1906, allowed the agent 50 per cent. of the first year's premium, 20 per cent. of the second, 15 per cent. of the third, and 7½ per cent. of subsequent premiums up to the tenth. Such renewal commissions have the element of insecurity arising from possible lapse or death of the policy-holder; hence some State insurance departments have refused to admit such loans as assets. A means of evading the appearance of carrying assets of doubtful validity has been the sale to banking institutions of agents' notes. Thus the Equitable on December 31, 1904, carried on its books $1,514,639 of such assets, while $5,813,184 was carried by trust companies, having been transferred to the latter by the Equitable.

While such assets, if limited to a small proportion of the renewal commissions, may be secure, and usually yield a high return, the more conservative insurance companies employ them to a very limited extent.

The bonds of great private corporations are an exceedingly common form of investment, and with reasonable care on the part of the investing companies, meet all the requirements as to security of principal and certainty of interest. Their yield is often low, as they are much in demand by other investing agencies. Corporation stocks, on the other hand, are generally regarded as unsuitable for the investment of life-insurance funds. They may be quite secure as to income; but their value is constantly fluctuating. In a time of panic, the value of such assets might easily shrink to such an extent that an insurance company which had invested largely in them would fall below the minimum of assets required by law for the protection of its reserves, and so be forced into liquidation.

The holder of corporate stocks, moreover, becomes in the measure of his holdings responsible for the management of the companies whose stock he holds. Thus the insurance companies, through stock holdings in banks, trust companies,, railroads, and the like, were forced to concern themselves with the management of business wholly foreign to life insurance, and often to the detriment of the life-insurance business.

The assets of the life-insurance companies reporting to the New York department consisted on January 1, 1905, of real estate, $165,037,788; bonds and mortgages, $704,429,523; stocks and bonds, $1,373,514,039; collateral loans, $44,864,594; loans on policies to policy-holders, $196,709,501; premium notes and loans, $19,096,593; cash in office or bank, $73,245,246; deferred and unpaid premiums, $45,149,901; other assets, $29,269,525; a total of $2,651,316,714. The item classed as stocks and bonds, making about one-half of the total assets, consists mainly of securities which find a ready market, and therefore subject to constant fluctuations in value.

Obviously such heavy investment in securities many of which are subject to speculative dealings gives the insurance companies a position of extraordinary influence in the financial world. In the floating of a new issue of corporation bonds, or the launching of a new corporation, the support of insurance investment was a factor hard to overestimate. Hence arose the practice of participation by the life-insurance companies in syndicates formed to underwrite large issues of corporate securities. The companies participating in such transactions, like ordinary speculators, disposed of the securities contracted for at an advanced price; and in most cases the syndicate transactions of the past years proved profitable to the companies. At the same time the business was hazardous; and the participation of life-insurance companies in underwriting syndicates has been generally condemned as unsound policy.

The officers of the insurance companies to whom the investment of funds was intrusted naturally enjoyed excellent opportunities for private gain. In some cases—although these were rare—an officer of an insurance company joined in a syndicate to purchase securities to be sold later to the insurance company at an advanced price. A more common practice was the participation, by officers of insurance companies, in syndicates in which the companies were themselves participants. Since the pur-

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urther source of gain to officers of the com-
s arose through the direction of investments
e companies through brokerage firms in
the officers were financially interested;
eposit of company funds in banks or trust
nies which elected the insurance officials to
directorships, etc. In some cases it has
shown that insurance companies retained
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surance companies contributed liberal sums,
life-insurance funds, to the Republican cam-
fund. The same thing was done, with less
nt reason, in 1904. Contributions to State
al committees have also been frequent.

orrect these abuses, the New York Legisla-
n 1906 prohibited the giving of party cam-
contributions by corporations chartered in
ate; it also prohibited the participation by
insurance company or any of its officials
erwriting syndicates. Further investments
ks or in bonds secured wholly or chiefly by
were prohibited, and the companies were
ed within five years to dispose of all such
ments now held.

ISLATION. The chief activity of Government
United States in respect to life insurance
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nce in the United States has shown a
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es, and it is only the activity of the Gov-
nt which has induced the companies to give
ir policy-holders adequate protection. Mas-
etts was the first State to establish an in-
e department (1855). It was also the first
to adopt a scientific method of insuring the
cy of an insurance company. That method
brief, to compel it to carry a reserve suffi-
o reinsure all its outstanding risks at net
m rates; that is, a reserve which is called
a calculation based on a specified mortality
table and rate of discount. The Actuaries' table and 4 per cent. were specified in the Massachusetts law, and have been adopted by most of the other States which have introduced the net valuation test of solvency. Some States, however, authorize the use of a discount rate of 4½ per cent., which diminishes somewhat the amount of reserve required. New York originally used the American Experience table, then changed to the Actuaries' table with 4 per cent. interest, and January 1, 1901, in recognition of the fall of the rate of interest in safe investments, returned to the American table of mortality with interest of 3½ per cent. This has materially increased the amount of reserve necessary for the companies to carry.

Not infrequently State laws require the investment within the State of the reserve on policies held within the State. Laws specifically prohibiting combinations for the fixing of premium rates are rare, but in most cases the State anti-trust laws are applicable to insurance companies. Laws relating to the taxation of insurance companies, or upon policies written by them within a State, are common. Such laws are regarded by insurance men as wholly unjustifiable, since they tend to discourage men from making due provision for their families in case of death. Much of the other State legislation, also, is of an unnecessarily burdensome nature. It has been estimated that the total cost of inspection, as conducted by the various States, is at least eight times as great as inspection by a single authority would be. This burden is in most cases borne by the companies.

A considerable number of the insurance bills proposed in the various State legislatures are chiefly designed, it is alleged, to blackmail the companies. Apart from blackmailing legislation, there are many laws proposed which the insurance companies are bound to oppose, in the interests of their policy-holders. The New York legislative investigation in 1905 disclosed the fact that some of the companies retained agents to watch legislation and to employ appropriate means to defeat obnoxious measures. The sums paid in recent years for this purpose by the New York Life alone aggregated over a million dollars. Exactly how the money was expended was not disclosed. The New York law of 1906 requires every agent representing a corporation before the New York Legislature to file with the Secretary of State a statement of the services he expects to perform, and to make public a sworn statement of all expenditures incurred.

The unsatisfactory character of State legislation has led many persons, including high insurance officials, to seek a remedy in federal regulation. On February 27, 1905, Senator Dryden of New Jersey, president of the Prudential Life Insurance Company, introduced in the Senate a bill declaring that insurance policies are articles of commerce, and that the delivery of contracts of insurance by a corporation of one State into another should be deemed transactions in interstate commerce, and subject to regulation by Congress. The bill further made provision for federal licenses and federal supervision of the business of all companies writing insurance beyond the borders of the State of their origin. In his message to Congress, December 5, 1905, President Roosevelt urged the importance of federal regulation of insurance. The matter was referred to the committees on Judiciary of the

House and Senate in the 1905-1906 session, but in view of the decision of the Supreme Court in the case of *Paul* v. *Virginia*, that insurance contracts are not articles of commerce, those committees reported adversely to the project. An effort was made in the same Congress to secure the enactment of a model insurance law for the District of Columbia, but action was postponed.

That more thoroughgoing legislation than existed in most States was required in view of the extraordinary development of the insurance business, was not generally understood until the disclosures of the methods of the companies in 1905 and 1906. Opposing financial interests, struggling for the control of the Equitable Society, led in February, 1905, to a determined effort on the part of James W. Alexander, president of the Equitable, and thirty-seven other officers of the society, to prevent the re-election of First Vice-President James H. Hyde, owner of a majority of the capital stock of the company. The officer named was, nevertheless, re-elected to the first vice-presidency, and in April a committee of the directors, with Mr. H. C. Frick as chairman, was appointed to investigate the charges of extravagance and mismanagement brought against Mr. Hyde. The report of the committee, made public June 2, 1905, showed that Mr. Hyde had involved the company in transactions of great magnitude without the authority of the executive committee; that he carried in his own name securities belonging to the company, with the result that he had been elected to numerous positions of trust in other corporations, often carrying with them large salaries; that he had used the funds of the company to pay for an elaborate entertainment given in his own name; that he had shared in syndicates which had effected sales of securities to the Equitable when he was a member of the committee which made the purchase in behalf of the company. The committee also made public the disposition of the society to pay inordinately large salaries. The president of the society was also censured by the committee for permitting these irregularities to continue for a long period.

The officers attacked in the report requested an examination of the affairs of the society by the State superintendent of insurance. The report of the State superintendent showed that the solvency of the company had not been impaired, but threw little further light upon the irregularities of management censured in the Frick report. Under the pressure of popular demand, a legislative commission was appointed in the special session of the New York Legislature of 1905 to examine into the business of the principal life-insurance companies doing business in the State. The commission, consisting of three senators and five assemblymen, with Senator W. W. Armstrong as chairman, began its sessions September 6, 1905, having secured Charles E. Hughes as counsel. The principal companies investigated were the Equitable Life Assurance Society, the New York Life, the Metropolitan Life, the Mutual Reserve Life, and the Mutual Benefit Life of New Jersey. Most of the abuses disclosed by the investigation have already been alluded to. In addition to these, mention may be made of the practice of disbursing the funds of insurance companies to secure space for publication matter favorable to the companies in the public press. Thus Vice-President Haley Fisk of the Metropolitan Life testified that in 1895, when the business of industrial insurance was under investigation in Massachusetts, his company spent $140,000 in paying newspapers to print matter favorable to the company. Even during the progress of the Armstrong investigation, according to an officer having charge of the literary bureau of the Mutual, $11,753 were spent by that company to buy space in one hundred newspapers to print favorable versions of the evidence taken by the committee.

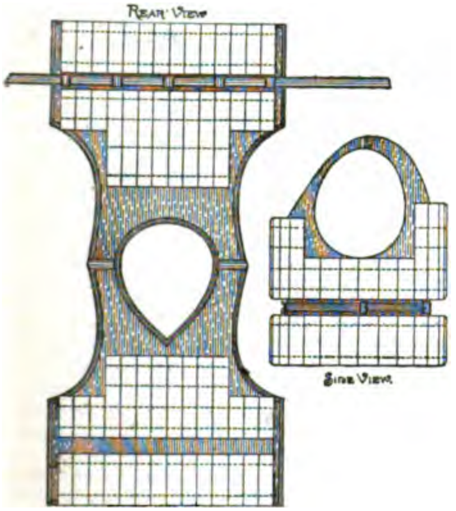
Another class of abuses disclosed was the manipulation of the assets of the companies to make a favorable showing in the reports of the insurance department, or to enable the company to enter upon business not permitted by its by-laws. The New York Life, toward the close of 1903, held $4,000,000 in International Mercantile Marine bonds,—a security not generally regarded as particularly desirable. To diminish the amount held for the purposes of the annual report, $800,000 of these bonds were, on the last business day of 1903, sold to J. Pierpont Morgan & Co., and repurchased by the company on the first business day of 1904. In order to secure a license to do business in Prussia, the New York Life had been compelled to dispose of all stock holdings. Instead of selling such stock on the market, the company sold it to a syndicate of employees of the company, receiving the notes of those employees in payment, and holding the stock as collateral.

As a result of the exposures, radical reforms were made in several companies. The president of the Equitable, in a letter published December 18, 1905, announced that economies amounting to over $600,000 had been effected in that society, mostly through reduction of salaries. On November 29, President Richard A. McCurdy and his son, Robert H. McCurdy, resigned from the Mutual. Successors were chosen at greatly reduced salaries. Other salaries were also cut, the aggregate saving being $225,000 per annum.

On February 22, 1906, the Armstrong Committee submitted its report on the insurance companies to the Legislature, and recommended a thoroughgoing reform of insurance legislation. Its recommendations were practically embodied in the law of 1906, the important provisions of which have already been discussed. The measure was enacted practically without opposition, although it is asserted by the insurance companies that it will seriously interfere with the development of insurance in New York State. In some of the other States the subject of the enactment of similar drastic legislation was discussed in the 1905-1906 session, but no definite action was taken. A convention of governors, attorneys-general, and insurance commissioners was held at Chicago, early in 1906, with the object of elaborating a scheme for uniform State laws, but action was chiefly confined to elaborating a plan for model legislation for the District of Columbia.

LIFE MORTARS AND ROCKETS. See LIFE-SAVING GUNS AND ROCKETS; LIFE-SAVING SERVICE.

LIFE-PRESERVERS. Contrivances adjustable to the body for buoying up persons in the water. They are made of various materials and in various forms. The best kind of ordinary life-preserver, such as is used on passenger vessels, is made of good, sound cork blocks, or other suitable substance, with belts and shoulder-straps properly attached, and so constructed as to place the cork underneath the shoulders and around the body of the person wearing it. It should contain at least six pounds of good cork, and have a buoyancy of 24 pounds. Cork cushions, with belts and shoulder-straps, are considered good substitutes for the jacket above described when they have the proper buoyancy. Life-preservers of an approved pattern are required by law on passenger vessels in the United States, and it is the duty of the inspecting officers to see that they are adequate and serviceable. Oarsmen in the life-saving service use an improved belt made of blocks of cork fastened to a cloth lining as shown in the cut. The man adjusts it by thrusting his head through the hole in the lining, the front and back parts falling into position and being secured by a lashing around the waist. This method obviates the necessity for shoulder-straps, and there being but one knot to tie or unfasten, the belt can be readily put on and removed. Tule and deer hair are used to some extent in the construction of life-preservers. Those in the form of inflated vests and overcoats are seen in service occasionally. Waterproof, air-tight life-preserving suits, consisting of headdress, jacket, and trousers, made of rubber or similar material, are seldom employed at the present time except by divers.



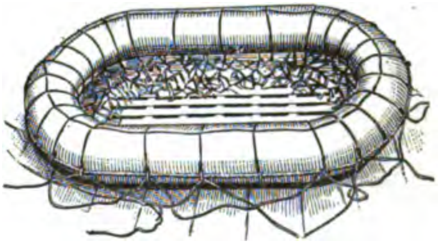
UNITED STATES LIFE-SAVING CORK JACKET.

LIFE-RAFTS. Structures used in saving life at sea. Nowadays nearly all seagoing steamers carry a certain number of rafts, of some approved description, as an equivalent for a portion of the small-boat capacity they are required to maintain. These floats, as a rule, can be conveniently stowed, are easily transported from one part of the vessel to another, may be launched overboard anywhere, and sometimes prove better instruments than boats for saving the shipwrecked. The devices of this kind are well-nigh innumerable. All depend for their extra buoyancy upon some ingenious method of utilizing air-receptacles, cork, etc. Rafts and floats intended to be carried on the decks of ocean steamers should have an actual buoyancy of 187½ pounds for each person that they will accommodate, and those for steamers on lakes, bays, sounds, and rivers, a buoyancy of 156 pounds for each person. Such rafts are equipped with life-lines and oars.

An effective contrivance, which is much used on passenger and other vessels, is the metallic cylinder life-raft, consisting of two cylinders, cone-shaped at the ends, firmly connected with cross-rods, and having slats running longitudinally between the hollow forms. This raft owes its great buoyancy to the air-filled cylinders.

ORDINARY CYLINDER LIFE-RAFT.

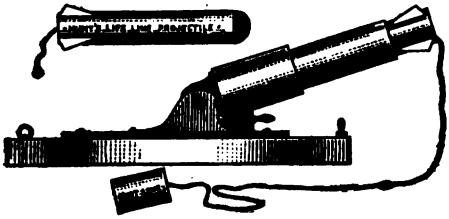
The Carley life-float is another and later form of raft. It consists of a copper tube, shaped like an ellipse, which is divided into air-tight compartments. The tube is sheathed with cork, the whole being covered with canvas and made water-tight. A bottom, composed of wooden slats, is suspended from the interior sides of the float by a rope netting about three feet deep. The netting is so arranged that, whichever side of the float may fall upon the water, the slatted bottom will go undermost. Oars and a signal flag are lashed to the tube. A large number of persons can be supported by this device, which is constructed in various sizes.



CARLEY LIFE-FLOAT.

LIFE RENT. In Scotch law, the usufruct, i.e. the right to the beneficial use and enjoyment of a heritable estate for life, the person entitled thereto being called a life-renter. The estate is nearly equivalent to the life estate of the English and American law, its distinctive features being derived from the Roman or civil-law system, on which the law of Scotland is based. See Civil Law; Life Estate; Usufruct.

LIFE-SAVING GUNS AND ROCKETS. Ordnance used to fire line-carrying projectiles from the shore to a wrecked vessel or vice versa. The Lyle gun, which is more generally used in the United States than any other, is described under Life-Saving Service. American ocean-going steamers are required to be supplied with some approved means of firing lines to the shore. The Hunt gun and Cunningham rocket are employed by many for such a purpose. The former, which was devised by Edmund S. Hunt, of Massachusetts, is mounted on a flat wooden carriage, to which it is fastened at the cascabel by a hinge. Elevation is obtained by use of a quoin between the forward part of the carriage and the under side of the gun. The projectile is the chief feature of the apparatus, and consists of a cylindrical tube of tin, into one end of which is soldered a solid hemispherical shot which rests on the cartridge in the gun. About half the shot line is coiled in the tube, from which it pays out during flight, the balance of the line being in a can, or on a reel, placed on the ground or deck. When the gun is discharged the weight of the line causes the projectile to reverse similar to the Lyle method. The Massachusetts Humane Society uses the Hunt gun, which has a range of more than 700 yards. The rocket, which is the invention of Patrick Cunningham, of the same State, consists essentially in a head carrying the projectile charge, in combination with a tube adapted and arranged to contain a coiled line. The latter is connected with a shore or deck line in the same manner as the Hunt system. This is a powerful rocket having a range of 1000 yards with a small line. It is fired from a stand. Guns, rockets, or mortars, of various designs, are used by all life-saving institutions for effecting line communication with stranded vessels. For other life-saving appliances, see LIFE-SAVING SERVICE.


HUNT GUN AND PROJECTILE..

LIFE-SAVING SERVICE. The Life-Saving Service of the United States was organized under the present system in 1871. Previously, however, a number of small boat-houses had been located on the coasts of Long Island and New Jersey, placed in charge of officers known as keepers, and imperfectly equipped with boats and appliances for the use of such of the coast residents as might volunteer to serve without compensation upon occasions of disaster. The act of April 20, 1871, gave the Secretary of the Treasury authority to establish additional stations on the coasts of Long Island and New Jersey, and to employ crews of experienced surfmen at such stations and for such periods as he might deem necessary, at a compensation not to exceed forty dollars per month. Upon this limited authority the inauguration of the existing system was undertaken. Subsequent legislation has extended it to embrace the entire ocean and lake coasts of the United States, and has added many improvements. Its purpose, primarily, is to save life from wrecked or imperiled vessels near the shore by means of organized equipment and effort. Next to the rescue of life is the saving of marine property.

In 1807 the Massachusetts Humane Society, a benevolent organization, placed a lifeboat station at Cohasset, which was the first regular attempt in this country to render direct aid to the shipwrecked from the shore. Later the society built a number of small stations and enlarged materially the scope of its work. The creation and extension of the Government service, however, relieved the society of much of its charge, although it still maintains some 50 small houses, equipped with boats and line-carrying guns, on the Massachusetts coast. Between 1848 and 1871 Congress made occasional small appropriations, commencing with one of $10,000 in the former year, for providing means for the rescue of life and property from shipwreck, and under the authority of such fragmentary legislation a number of houses were established along the seaboard furnished with boats and some other life-saving appliances. Lifeboats were also placed at scattered points on the Atlantic and lake coasts. The stations erected had to rely upon volunteers from among the fishermen in the various localities to man the boats and apparatus as occasion required. While there was much of value in this inchoate service, its defects were many and serious. Finally the occurrence of a number of disasters to vessels and their crews on the Atlantic Coast, disclosing the inadequacy of the means of succor then at hand, so aroused public sentiment as to cause the enactment of national legislation, upon which the present life-saving system is based. It is the only governmental service, all other life-saving institutions, except one or two small European organizations, being maintained wholly or in part by private contribution.

At the close of the fiscal year which ended June 30, 1901, there were 270 stations included in the service. Of these 195 were situated on the coasts of the Atlantic Ocean and the Gulf of Mexico, 58 on the shores of the Great Lakes, 16 on the Pacific Coast, and 1 at the falls of the Ohio River, Louisville, Ky. Eight stations included in this summary were houses of refuge on the eastern coast of Florida. For the convenience of administration, the sea and lake coasts, which have a general extent of about 10,000 miles, exclusive of Alaska, are divided into separate districts numbered from 1 to 13 inclusive. These districts have been fixed with reference to the conformation of the shores, there being 8 on the Atlantic, 1 on the Gulf, 1 on the Pacific, and 3 on the lakes, one of the last-named (the 10th) including the station at the falls of the Ohio River.

The station buildings are located at points of danger to shipping, most of them being at exposed places. Those on the ocean coast are generally two-story wooden structures, built to withstand severe winds and the encroachment of storm tides, and, when conditions permit, are placed sufficiently back of high-water mark to make them safe. The stations on the lakes are similar to those on the seashore. Many of them, however, are located in the vicinity of harbors, behind piers or breakwaters, and are specially devised for the use of the heavy lifeboats employed in that region. The interiors of the buildings are divided into suitable apartments for the accommodation of the crews and the reception of the live-saving appliances, the largest space being allotted to the boatroom, from which a sloping platform leads for the running out of the heavier equipments. Stations exposed to view from off shore are so painted that they can be distinguished a long distance. Each has a lookout tower, or platform, where the day watch is kept, and is marked by a flagstaff that may be used in signaling passing vessels. Two stations, the one on the Ohio River and another in Boston Harbor, are house-boats, or floating stations, which are moored in their respective localities and are equipped and manned for their special purposes. The houses of refuge on the coast of Florida are small dwellings, each large enough for the residence of one man, who has charge, and his family. They are supplied with provisions and other necessaries and are intended for places of shelter only, as the character of the neighboring shores makes it possible for wrecked persons to reach the land with little difficulty, their chief danger being from hunger and thirst.

The stations are designated by local names indicating their positions. When they are near each other, some being not more than four or five miles apart, they are connected with telephone lines, which makes it easy to concentrate two or more crews in combined effort at the scene of wrecks. It often happens that several vessels strand at the same time in the same neighborhood, and for this reason it is desirable to have means to assemble speedily the necessary force to assist them. Whenever practicable, unadjacent stations are connected with the nearest available point that will put them within telegraphic reach. The telephone lines of the service are of value to the commercial interests of the country, as they are used in giving maritime exchanges, underwriters, and others concerned early notice of disasters, and in advising them of the condition of wrecked vessels and their cargoes. During the war with Spain the telephone system was used by the surfmen as a military coast signal service.

The stations on the Atlantic and Gulf coasts, with the exception of the floating station at Boston, are manned from August 1st to May 31st of each year. In the months of June and July, termed the inactive season, the keepers alone are in charge on those coasts, that being the period least liable to high winds and rough water. The members of the crews, however, who are off duty at that time are required to respond promptly to any call for assistance that may reach them, and are paid for services rendered on such an occasion, while volunteers are also relied upon in case it becomes necessary to attend a wreck. Stations on the Pacific Coast, and the one at Louisville, are manned continuously, while on the Great Lakes active service covers the interval between the opening and closing of navigation. The floating station in Boston Harbor is employed from May 1st to November 15th of each year, its work, like that of the Louisville station, consisting largely in the rescue of imperiled persons from small craft and requiring unremitting vigilance. Its equipment includes a steam launch and two gasoline launches.

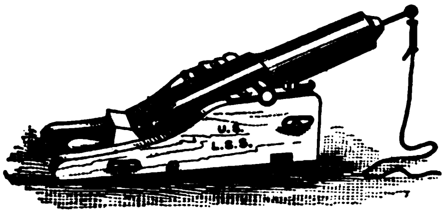
A life-saving crew is composed generally of a keeper and from six to eight surfmen, although the number depends a great deal upon the nature of the service they are to perform, in some cases a larger crew being necessary to man a station properly. At most of the stations on the Atlantic Coast an extra man is put on during the winter season. A surfman must be a citizen of the United States, not under eighteen nor over forty years of age when originally enlisted, able to read and write the English language, physically sound, a good swimmer, and experienced in the management of boats. Appointments are made upon examination and certification by the Civil Service Commission. Great care is exercised in selecting the men, no one being admitted or promoted to a higher grade who has not furnished manifest proof of his fitness for the position. A vacancy in the keepership of a station is filled by the promotion of a surfman judged to be the most competent available man in the district.

The keeper is intrusted with the care of the buildings and their contents and the government of the station. He is the captain of the crew over which he has control. In the boat he takes the steering oar and at other times directs the operations. The crews are put through a rigid course of drills, recitations, and inspections, which the keeper carries out on specified days each week, weather and surf permitting, while the district officers and others in authority make frequent visits to the stations. The drills, which the regulations of the service prescribe, are with the beach apparatus (each station has a drill-ground on which is a wreck pole representing the mast of a stranded vessel), surf and life boats, life-car, international and general service signal codes, method of resuscitating the apparently drowned, etc. Keepers and surfmen provide themselves with uniforms which they are required to wear at all times when on duty.

The service uses several principal appliances for saving life from shipwreck. The first of these is the cedar surfboat, which is the boat most suitable to launch from flat beaches through the shoaling waters of the Atlantic and Gulf coasts. The various types of this boat are developments of the boats used in surfing by the fishermen of Long Island and New Jersey when the first stations were placed on those shores. Those in most general use are from 22 to 27 feet long, 6 to 7 feet beam, and are provided with end air-chambers which make them insubmergible. Each is completely equipped with oars, boat-hooks, boat-hatchets, bailing-buckets, life-preservers, life and righting lines, cork fenders, an anchor, a canvas drogue, heaving-stick, etc. This boat, being comparatively light, can easily be hauled along shore on its carriage. Its action in the hands of the station crew is often marvelous, the boat being manœuvred in the breakers and in proximity to wrecks with great dexterity. It is propelled by from five to eight oars, and is expected to carry, besides the crew, from nine to twelve persons, although as many as fifteen have been safely landed at a time in a bad sea.

Other contrivances are the self-bailing and self-righting lifeboat, a reproduction of the English model, and the Beebe-McLellan self-bailing boat of American design. (See LIFEBOAT.) Lifeboats are used with good effect on the Great Lakes, where the conditions favor their employment, are utilized to some extent at selected points on the ocean coast, and often go long distances under sail. The matter of placing boats at stations has always to be carefully considered, as the type which may be suited to one locality may be entirely unfitted for another.

When it is impracticable to use a boat, wreck ordnance is relied upon for communicating with stranded vessels. A small, bronze, smoothbore gun, weighing with its carriage 185 pounds, invented by Major David A. Lyle, of the army, is the appliance in general use. It carries an 18-pound elongated cast-iron projectile, in one end of which is an eyebolt or shank that projects sufficiently beyond the muzzle of the gun to protect the line which is fastened to it from being burned off. When the gun is fired the strain of the line causes the projectile to reverse. A range of nearly 700 yards, with a small shot-line, has been obtained with this gun under favorable circumstances, although the piece is not often called upon to cover a range of more than 400 yards.



LYLE GUN.

The breeches buoy is a circular life-preserver of cork, about 7½ feet in circumference, to which short canvas breeches are attached. It holds one person, is suspended by lanyards from a hawser, and is drawn to and from the wreck with lines. On account of its being safe, as well as light and easy to transport and handle, and from the further consideration that the greater number of vessels now stranding on the coast have small crews, from six to ten, it is more frequently used than the life-car.

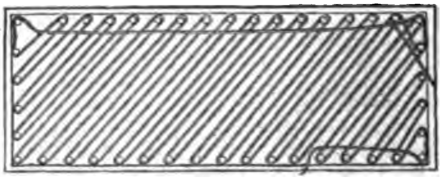
The life-car is made of galvanized sheet iron and is shaped like a covered boat with an opening on top, provided with a hatch which may be fastened inside or out. While practically water-tight, it has means for supplying air to those within. It is between 10 and 11 feet long, has sufficient capacity for five or six persons, and may be connected with a hawser and hauled in the water to and from a vessel, or can be operated similarly to the breeches buoy. This car has been found very useful in landing sick people and valuables, as they are protected from getting wet.

There are a number of appliances, auxiliary to the principal means of saving life, belonging to the regular outfit of a station. Among these are boat-wagons, roller boat-skids, apparatus-carts, cork jackets, heaving-sticks, signal-flags, night warning signals, beach torches, patrol lanterns, medicine-chests, hawsers, hauling-lines, etc. At some points, where the outlying bars are a considerable distance from the shore, powerful line-carrying rockets, which have a greater range than the gun, are kept, but there have been few calls for their use.

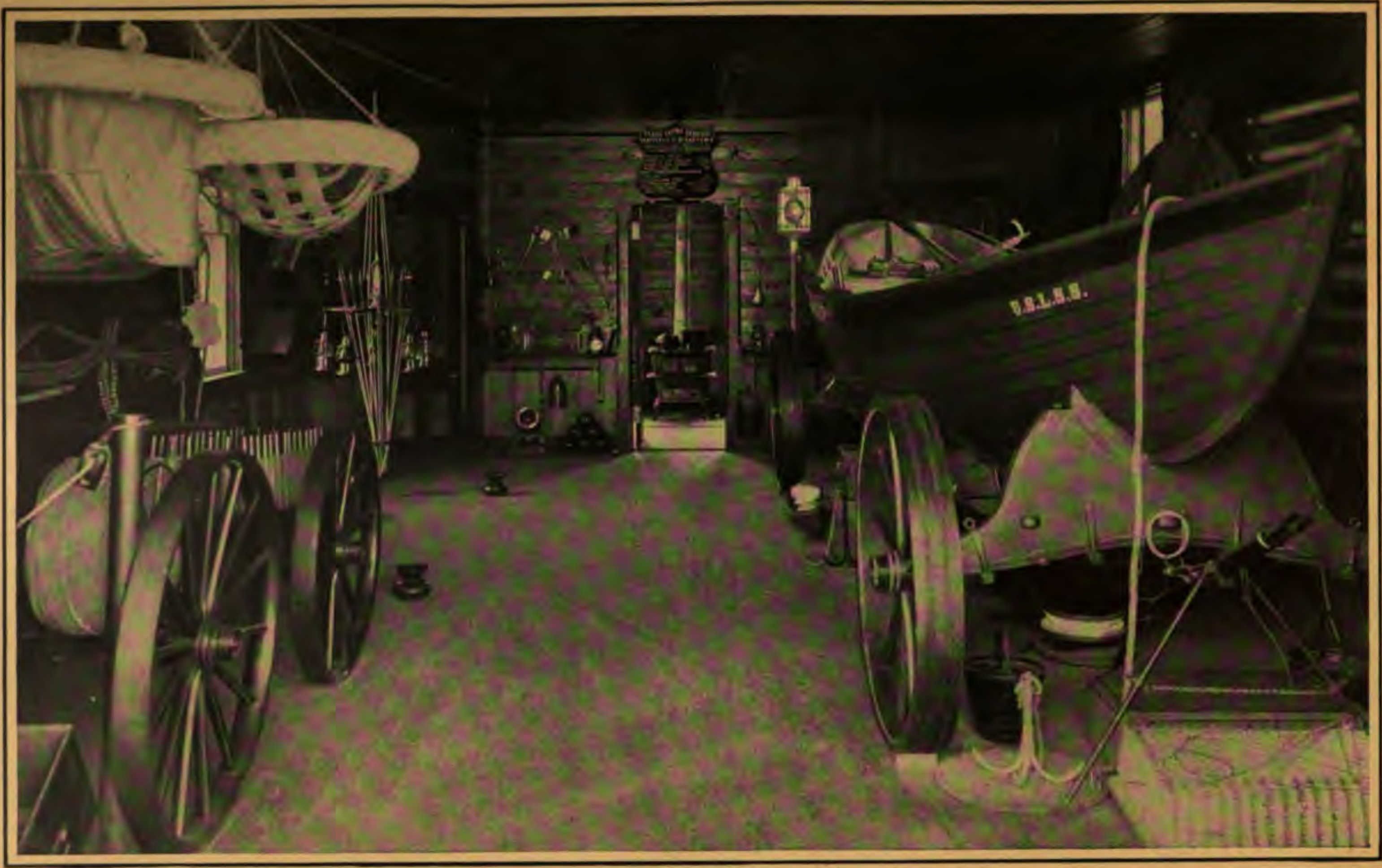
In the day a strict lookout seaward is kept from the stations for distressed craft, and during the night between sunset and dawn, and at all times when the weather is thick and stormy, the patrolmen maintain a steady vigil along the beach. At the beginning of their watch two surfmen from each station follow the shore-line in opposite directions until they meet the patrolmen from the adjacent stations, with whom metallic checks, suitably marked, are exchanged and taken to the keepers as proof of the honest performance of duty. When the stations are remote from each other this scheme, of course, is not practicable, and then the patrolman carries a watchman's clock which can be registered as to time of arrival only by means of a key contained in a post at the limit of his beat. Each man carries, besides a lantern, a night signal which, when exploded by percussion, emits a red flame that flashes far out over the dark waters and warns the unwary ship, approaching too near the breakers and outlying reefs or shoals, of impending danger, or assures the shipwrecked that help is close at hand. The patrol system is a feature that distinguishes the United States service from all others in the world, and accounts largely for its unrivaled success in affording relief to seafarers. During the year 1901 231 craft were warned away from dangerous places by the signals of the patrolmen. At some stations, where service is likely to be facilitated by the use of horses, and where the shore is suitable, patrolmen on extended beats are permitted to go mounted.

When the watch, either at night or in the day, discovers a vessel ashore, he takes instant measures to alarm the crew of the station. Sometimes this may be quickly accomplished by use of the telephone in a near-by watch-house; otherwise the surfman must hasten on his errand as best he can. The condition of the weather and surf will indicate to the keeper whether a rescue should be attempted by means of a boat, the breeches buoy, or life-car. Either the boat must be hauled on its carriage or the apparatus-cart dragged to the scene of the wreck. Draught-animals are kept at many stations to facilitate and hasten the transportation of the appliances, but when they are not provided the keeper may hire horses when needed.

If the rescue is to be effected by means of the beach apparatus, no time is lost, after selecting a suitable place abreast of the vessel, in setting up the gear. Each one of the crew proceeds at once to break out the part assigned to his charge and place it in position. The keeper fires the gun and the slender shot-line goes flying over the stranded vessel. This line, to insure its running out without entanglement or friction, has been previously faked over pins, layer upon layer, and inclosed in a box. When brought into use the box is inverted and the pins are withdrawn, leaving the line disposed in loops so that it will pay out freely. The shot-lines are soft-laid and are of three sizes, numbered 4, 7, and 9, being respectively 4-32, 7-32, and 9-32 of an inch in diameter. The sailors on the vessel, with the shot-line that has been sent them, haul off an endless rope, rove through a tail-block, called the whip-line. If the masts are standing, the tail-block is made fast to the lower mast, well up. The life-saving crew then send off by the whip a 3-inch hawser which is secured to the mast about two feet above the tail-block. By means of a strong tackle attached to a sand-anchor, consisting of two pieces of flat, stout timber, crossed and bolted, and buried in a trench to support the strain, the surfmen set taut the hawser, passing it over a wooden crotch about ten feet



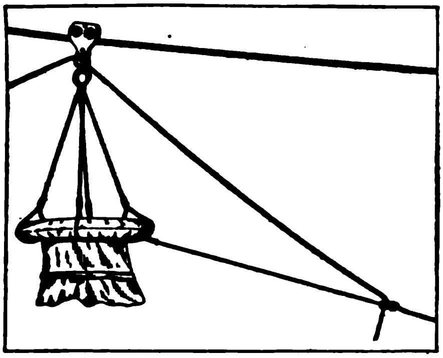
METHOD OF FAKING THE SHOT-LINE.



BOAT-ROOM OF A TYPICAL LIFE-SAVING STATION, SHOWING APPARATUS

high which firmly suspends the line between ship and shore. The breeches-buoy block is usually snapped upon the hawser and the buoy is hauled to and from the wreck with the whip-line. Small wooden tablets called tally-boards, bearing printed directions in English and French for handling the lines, are attached to the whip and hawser and sent off to the people on the vessel to enable them to coöperate intelligently with the agencies at work for their rescue. In the usual drills at the stations the life-saving crews accomplish the rescue in about five minutes, although it has been made without error in two and one-half minutes. Of course such time cannot be expected in actual service at shipwrecks, where many unfavorable elements conspire to obstruct progress.

WHIP-LINE TAIL-BLOCK AND TALLY-BOARD.



THE BREECHES BUOY.

The survivors from a wreck within scope of the service are cared for at the station nearest the scene of the occurrence. The victims of marine disaster are often recovered from the water apparently drowned or dead from exposure. In such cases the surfmen attempt restoration by the methods in which they are drilled, their efforts in about half the trials turning out successfully.

The Life-Saving Service, owing to its relation to commerce, and the assistance it renders in the collection of revenue and the prevention of smuggling, is connected with the Treasury Department. The chief officer in charge is the general superintendent, appointed by the President, the incumbent in 1902 being Sumner I. Kimball, who has been the head of the service since it was established in 1871. The general superintendent is assisted in the performance of his duties by an assistant general superintendent. A captain of the Revenue Cutter Service is detailed as inspector of stations. He personally visits them at stated times and discharges such other duties as the general superintendent directs. The superintendents of construction of life-saving stations are also captains of the Revenue Cutter Service. Each district is under the immediate charge of a superintendent who has been promoted to his position from the ranks of the keepers. His business is to conduct the general affairs of the stations under his supervision, which he visits at least once a quarter, recommend supplies, repairs, etc., pay off the men, inspect public property, fix the patrol limits, after consultation with the resident inspector, certify the names of eligibles for vacancies in the crews, and see that the regulations governing drills and discipline are faithfully fulfilled. The district superintendents and keepers are, under the law, inspectors of customs and as such take care of the Government interests in relation to dutiable property wrecked within their jurisdiction. Assistant inspectors for the various districts are obtained from the officers of the Revenue Cutter Service, who periodically inspect the stations, drill the crews, make investigations into the conduct of keepers and surfmen, when such action is necessary, and in cases of shipwreck within the domain of life-saving operations attended with loss of life, and give attention to such other matters as may be assigned them by superior authority.

For the purpose of examining and testing devices, plans, and inventions for the improvement of station equipments, an advisory board is constituted, consisting of experts, which meets annually, as a rule, to consider matters submitted to it by the general superintendent.

Members of crews, including keepers, who become disabled in the line of duty may be continued on the rolls of the service, under pay, during the continuance of their disability, not to exceed one year, except in the most meritorious cases, but not longer than two years in any case. In case of their death, from disease or other cause incident to the service, their widows and children under sixteen years of age, if they have any, are entitled to receive for two years, in equal portions, the same pay that the husbands or fathers would have received had they lived.

Gold and silver medals are awarded in cases of heroism, where persons endanger their own lives in rescuing or endeavoring to rescue lives from the perils of the sea. These rewards, however, are not confined to the professional life-savers, but may be bestowed upon others who have shown conspicuous heroism on such occasions.

The general superintendent, in accordance with the requirements of an act of Congress, publishes annually a complete report of life-saving operations. Incorporated in this is also a collection of statistics of marine disasters, at home and abroad, put in tabular form for convenient reference, which is of great value to commerce. The net cost of maintaining the service during the fiscal year ending June 30, 1901, was $1,682,793.74. The results of service operations for the same period are as follows:

Number of disasters	770
Value of property involved	$7,567,540
Value of property saved	$6,565,275
Value of property lost	$1,002,265
Number of persons involved	3,775
Number of persons lost	17
Number of persons succored at stations	647
Number of days succor afforded	1,214
Number of vessels totally lost	43

FOREIGN LIFE-SAVING SERVICE.

In nearly all maritime countries some organized means exist for assisting the shipwrecked from the shore. These means, with few exceptions, are controlled and supported either wholly or in part by private institutions. China for centuries has had a life-saving service, operated by benevolent societies, which has been mainly directed to rendering aid and preventing casualties on the great waterways of the Empire. A society for saving life from shipwreck was formed in Japan in 1890. The following summary embraces the principal efforts in this direction that have been made in European countries:

Austria. The conditions on the east coast of the Adriatic do not render necessary the maintenance of a regular life-saving service. In case of shipwreck or other marine casualty the health officers of the port or harbor police are required to give the first aid to those in danger, and to relieve and take charge of vessels and cargoes. Specially constructed lifeboats, ready for immediate use, are stationed for this purpose at a number of the ports, while steamers and other boats are employed in emergencies.

Belgium. A small service, which was organized in 1838, is maintained by the Government. Life-saving stations are scattered along the coast, over an extent of about 400 miles, and these are provided with lifeboats, completely equipped, wreck guns and projectiles, and other apparatus for assisting crews and vessels in distress. The appliances are kept in sheds situated at places accessible to the beach. Medicines and surgical implements are also supplied, a physician being appointed to care for shipwrecked crews.

Denmark. The institutions for the rescue of the shipwrecked are those of North Jutland, Bornholm, and Möen, the expenses of which are defrayed by the Government. The service was organized in 1852, but means for the relief of distressed seamen were adopted at certain points on the coast before that time. Lifeboats and rocket apparatus are used and the work is performed by overseers and boatmen, there being some fifty or more stations and sub-stations on the coast of Jutland, where the principal efforts for saving life are directed.

France. The task of maritime life-saving is performed by the Société Centrale de Sauvetage des Naufragés, which was founded in 1865. The organization is somewhat similar to that of Great Britain and is supported mainly by voluntary contributions, the Government granting some financial aid. The society has between 400 and 500 stations on the coasts of France and Algeria, and employs more than 2000 persons, most of whom, however, are in the customs service. About one-fifth of the stations are provided with lifeboats. Unlike most of the foreign services, the French use the gun in preference to the rocket for effecting line communication with vessels, and the claim is made that to M. Ducarne de Blangy is due the credit of having first invented a line-carrying projectile in 1790.

Germany. The entire life-saving service is under the management of the 'German Society for the Rescue of the Shipwrecked,' which was founded in 1865. It is under the patronage of the Emperor and is wholly supported by voluntary contributions, there being more than a hundred stations on the coasts of the Baltic and North Sea. About half of them are equipped with both boats and rocket apparatus, the others having boats or rockets only.

Great Britain. Life-saving operations are conducted by the Royal National Lifeboat Institution, which was established in 1824. This organization, which is aided by various local corporations and private parties, provides lifeboats and apparatus for the whole English coast. There are more than 300 lifeboat stations under its management. Except a coxswain and an assistant for each boat, who receive annual salaries, the boatmen are volunteers, who are paid for each occasion of service. The rocket service, which embraces a large number of stations, is in charge of the Board of Trade and was organized in 1855. Operations on wrecks are under the supervision of the Coast Guard, which patrols the coast. The English claim that Lieutenant Bell, of the Royal Artillery, first invented, in 1791, a method for projecting a line to a vessel from the shore.

Holland. Two private companies carry on the life-saving operations, one at Amsterdam and the other with headquarters at Rotterdam. The former, which appears to be the more important, is supported by donations from private sources, no assistance being received from the Government. The exertions of the company are confined exclusively to the saving of imperiled persons, about twenty-five stations, provided with lifeboats, being maintained. Fifteen of these have rocket apparatus also.

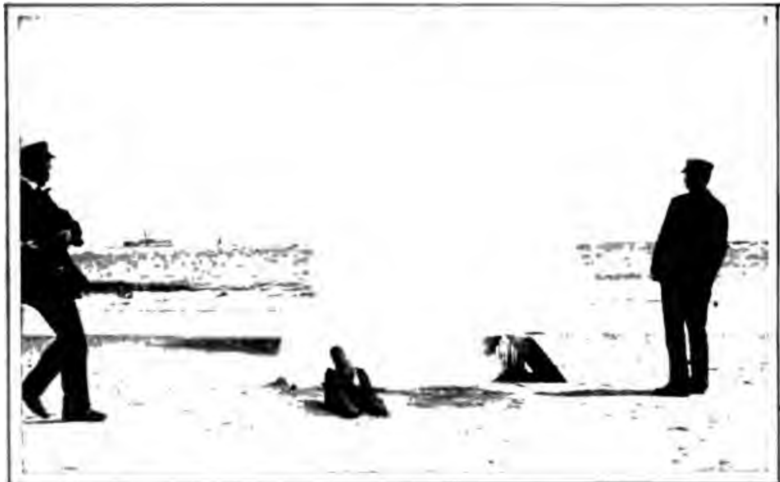
Italy. The principal life-saving institution is the Società Italiana per provvedere al Soccorso dei Naufraghi, which has its central offices in Rome. It maintains eight lifeboat and two rocket stations. There are besides a number of local societies for alleviating the miseries of the shipwrecked or for resuscitating persons apparently drowned. One of these, the Società Ligure di Salvamento, has sixteen huts of refuge.

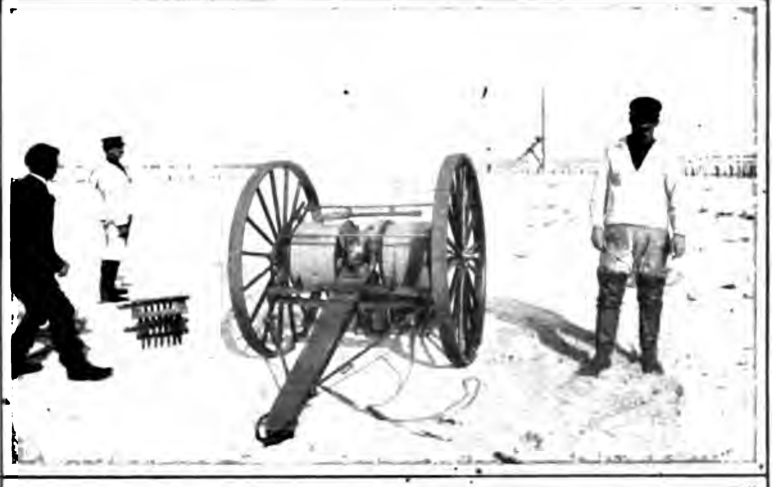
Russia. The work of rendering assistance to persons in distress on the seas, lakes, and rivers is directed by a society established under the patronage of Her Majesty the Empress. It is supported mainly by private benefactions. The business of the society is managed by a principal board located at Saint Petersburg, and by a number of district and local boards in various towns and villages. The stations number nearly a thousand of all kinds, including boat and rocket stations, winter stations, substations, places of refuge, lighthouses, posts, etc. The compensation of the life-saving men is determined by the district boards, some of the keepers and crews being paid annual salaries, while others receive remuneration for service and drill only.

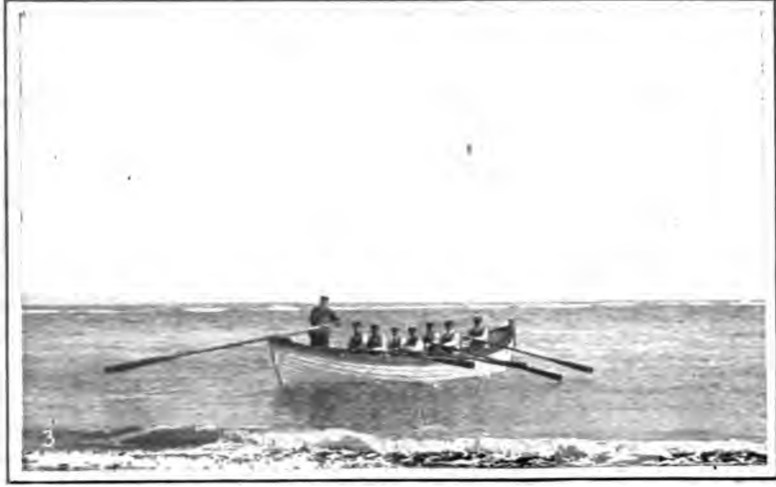
Spain. The 'Spanish Society for Saving the Shipwrecked,' with a central board in Madrid, which was reorganized in 1880, has charge of the life-saving service. It receives both Government and private gratuities. Its object is to save lives only. Some fifty stations are supported, supplied with boats, line-throwing apparatus, etc., while life-saving appliances of various kinds are kept at many of the lighthouses.

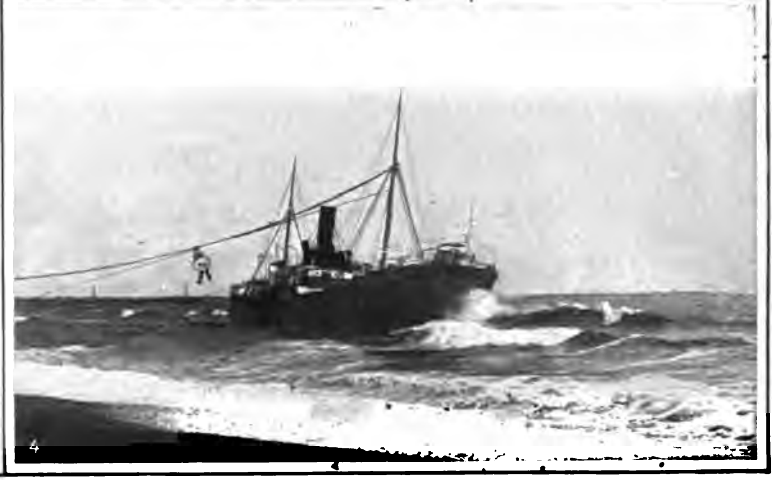
LIFFEY, lĭf′fĭ. A river of Leinster, Ireland, rising in the Wicklow Mountains, 12 miles southwest of Dublin (Map: Ireland, E 3). After a semicircular course of 70 miles, south, west, and northeast, it divides the city of Dublin (q.v.) in two, and flows into Dublin Bay on the Irish Sea.

LIFE-SAVING SERVICE









1. Lyle gun being fired.
2. Apparatus cart and Lyle gun just after firing—Projectile in the air.

3. Beebe-McLellan self-bailing water-ballast surf-boat.
4. Rescue with breeches buoy, Cape Ann, Mass.

their circulation, and for bringing about a cessation of blood-flow through an aneurism.

The usefulness of the ligature depends upon the fact that when the internal coat of an artery is torn off or injured, the blood clots, the fluidity of the blood depending upon the integrity of this coat. Ligatures are therefore applied with sufficient force to rupture the internal and middle coats and constrict firmly the outer coat of the artery. Clotting takes place as far as the nearest branch, and this portion of the vessel is ultimately converted into a fibrous cord. Injured arteries of any size are tied on both sides of the wound to prevent possible recurrent hemorrhage from connecting branches. When the injured point is not accessible the ligature is sometimes placed at a distance from the wound.

In the treatment of aneurisms, the ligature is placed upon the artery, when possible, between the heart and the sac, and at some distance from the aneurism, for the reason that the artery in the vicinity of the aneurism is too diseased to resist being cut through by a ligature. This operation was devised by Hunter. Brasdor afterwards conceived the idea of tying on the distal side of the aneurism; a barrier to the blood-current is just as effectively formed, collateral branches above the aneurism enlarge, the blood is diverted and a clot forms in the aneurismal sac. Another device is that of Wardrop, which consists in tying one of the branches of the artery below the aneurism.

The important operations in arterial ligature are those involving the subclavian, innominate, carotid, and iliac arteries, and the abdominal aorta. The latter vessel has been tied on nine or ten occasions and the operation has always resulted fatally. It was first performed by Sir Astley Cooper in 1817, the patient surviving forty-eight hours; the latest case, reported (1902) by Keen, an American surgeon, survived forty-eight days. These operations are done only in cases of desperate need, either in the event of an aneurism about to rupture or alarming hemorrhage from penetrating wounds. See ANEURISM; CIRCULATION; BRASDOR'S OPERATION.

LIGATURE. In music, a slur or tie, hence a term which indicates that a group or series of notes is to be executed coherently; if in vocal music, that they are to be sung with one breath. The term is used in instrumental music to mark the phrasing. In mensurable music ligature denotes a group of notes that are to be executed on one syllable. See MENSURABLE MUSIC.

LIGHT (AS. *lēoht*, Goth. *liuhap*, OHG. *lioht*, Ger. *Licht;* connected with Lat. *lucere*, to be bright, Gk. *λευκός*, *leukos*, bright, Ir. *loche*, lightning, OChurch Slav. *lucha*, beam of light, Skt. *ruc*, to shine). The sensation of which one becomes conscious through the optic nerves. In general the cause of this sensation is the entrance into the eye of ether-waves whose wave-numbers lie between certain limits; and therefore such unscientific expressions as 'light enters the eye,' 'light-waves,' etc., are often used. From the standpoint of physics one is concerned with the problem of the production of these ether-waves, their propagation and their entrance into the eye; after reaching the retina their further action becomes the study of physiology.

Any proper physical explanation of light must show that all the phenomena of ether-waves both in the pure ether and inside material bodies may be deduced from certain dynamical equations; and with our present knowledge of matter and the ether this can be done with a fair degree of satisfaction. There are, however, many phenomena which do not require for the explanation of their main features any exact knowledge of the properties of ether and matter, but which may be referred to certain general mechanical principles. Thus, the most important phenomena of interference and diffraction may be explained by the general principles of wave-motion; and the most striking features of lenses, mirrors, and prisms may be shown to follow from the treatment of 'rays of light,' assuming the laws for reflection and refraction of rays.

That portion of the subject of light which may be explained by the use of the idea of rays is called 'Geometrical Optics;' that portion which uses the idea of wave-motion is called 'Physical Optics;' and the complete treatment which explains the laws of rays and of waves and connects all the phenomena of dispersion, reflection, magnetic rotation, etc., by one set of dynamical equations is called the 'Dynamical Theory of Light.'

HISTORICAL SKETCH.

Geometrical optics is not entirely a modern science, for the Greeks and their disciples the Arabs were acquainted with the law of reflection and its more immediate consequences. Aristotle, Euclid, Archimedes, Hero, and Ptolemy knew that light was transmitted in straight lines; but with the important exception of Aristotle, and some of his followers, the ancient philosophers believed that rays proceeded *from* the eye *to* the object, instead of in the contrary direction. Ptolemy was well acquainted with atmospheric refraction. Alhazen (early part of eleventh century) and Vitellio the Pole (1260) were almost the only students of this science during the Middle Ages, and their additions to it were unimportant. The lens, though known from early antiquity, was not applied as an aid to defective eyesight till after the time of Roger Bacon. Jansen, Metius, and Galileo separately invented the telescope (q.v.) about the beginning of the seventeenth century; and with it the last-mentioned philosopher (see GALILEO) made various important astronomical discoveries. Kepler, shortly after, gave the true theory of the telescope, explained the method of finding the focal length of lenses, and applied it to find the magnifying power of the telescope, besides pointing out the mode of constructing an instrument better adapted for astronomical purposes than that of Galileo; he also made some useful experiments on the nature of colors, and showed that images formed on the retina of the eye are inverted, a fact previously discovered by Maurolycus of Messina. From this period the science of optics steadily advanced through the labors of De Dominis, Snell (the discoverer of the law of refraction in 1621), Descartes, Fermat, Barrow, Mariotte, and Boyle. Up to the time of Newton it was generally believed that color was produced by refraction, but he showed by a beautiful series of experiments that refraction only separates the colors already existing in white light. In his hands the theory and construction of the telescope underwent many valuable improvements, and in 1672 the description of his reflecting telescope was submitted to the Royal Society. Gregory had constructed an instrument on similar principles some years before. About the same time, Grimaldi made his interesting series of experiments on diffraction, and noticed the remarkable fact of the interference of one pencil of light with the action of another.

To explain the phenomenon of sharp shadows Newton advanced his 'corpuscular' theory of light, the idea of which was that light is due to the emission of streams of fine particles from the source of light. To explain refraction on this theory it was necessary to assume that the velocity of light is less in air than in glass or water. Using this theory, Newton tried to explain diffraction and the colors of thin plates; but the hypotheses involved in the explanation were too involved to be satisfactory. The important services of the ingenious but eccentric Hooke cannot be easily stated in a few words, as he discovered a little of everything, completed nothing, and occupied himself to a large extent in combating faulty points in the theories of his contemporaries. It must not, however, be forgotten that he has as much right as Huygens to the credit of originating the undulatory theory, though Hooke made little more than a lucky guess, while Huygens gave a remarkable discussion of the application of the theory to reflection and refraction. Newton's corpuscular theory was, however, the accepted one until the work of Young and Fresnel. The double refraction of Iceland spar was discovered (1669) by Bartholin, and fully explained in 1690 by Huygens. The velocity of light was discovered by Roemer (1675), and in 1720 the aberration of the fixed stars and its cause were made known by Bradley, who likewise determined with accuracy the amount of atmospheric refraction. The fact that the two rays produced by Iceland spar were 'polarized' was known to Huygens; but polarization by reflection was not known until discovered by Malus in 1808. The properties of polarization were then investigated by Brewster, Biot, and especially by Arago.

The proof that light is due to wave-motion was first given by Dr. Thomas Young, who published his work on interference in 1801. The difficulty of accounting for polarization phenomena by the theory of waves was first met by Fresnel, who proposed the idea that the ether-waves are transverse, and showed how this hypothesis perfectly explained the observations. It is to Fresnel also that we owe the explanation of rectilinear propagation and of diffraction. The attempt made by Fresnel to give a dynamical theory of light was not successful, although he did deduce formulæ for reflection, refraction, and total reflection which are in good accord with experiment. Green, Lord Kelvin, Helmholtz, Stokes, Rayleigh, and more recently Poincaré, Larmor, and Lorentz, have advanced dynamical theories with more or less success; the theory of Lorentz based on the motion of electrons is most satisfactory.

GEOMETRICAL OPTICS.

It is assumed in this subject—as the result either of direct experiments or of deduction from physical optics—that 'rays of light' pass in straight lines through any homogeneous medium; that they are independent of each other; that when a ray meets a surface separating two transparent material media, e.g. water and air, it produces a reflected ray back into the first medium and a refracted ray in the second medium, the two having definite directions given by the laws of reflection and refraction. The laws of reflection are: If a tangent plane is drawn to the separating surface at the point where the ray strikes, the line perpendicular to this plane at the point bisects the angle between the incident and reflected rays and lies in the plane which includes them. The laws of ordinary refraction are: If a tangent plane is drawn to the separating surface at the point where the ray strikes and if a perpendicular line to this plane is drawn through this point, it will lie in the plane including the incident and refracted rays; and if the angles between these rays and the perpendicular line are θ_1 and θ_2, the ratio of sin θ_1 to sin θ_2 is a constant for the two media for a given kind of light. This ratio is called the 'index of refraction of the second medium with reference to the first;' it is found to vary for light of different colors. If the first medium is the pure ether, this ratio is called the index of refraction of the second medium.

There are certain bodies—either crystal or isotropic bodies in a state of strain—such that when an incident ray falls upon them, not one, but in general *two* refracted rays are produced. This is called 'double refraction.' In one class of bodies one of the refracted rays obeys the ordinary laws of refraction and is called the 'ordinary ray,' while the other ray does not in general do so and is called the 'extraordinary' ray. In other bodies neither of the refracted rays obeys the ordinary laws in general. The main features of bodies of the former class, e.g. Iceland spar, were fully explained by Huygens on the wave theory, while those of the latter class, e.g. aragonite, were explained similarly by Fresnel. See section on *Physical Optics* below.

SHADOWS. If rays pass in straight lines, the main phenomena of shadows are at once explained. A small source of light, a 'point-source,' will cast sharp shadows of any opaque object which stops the rays. If the source of light is large, like a window, there will be certain points in the shadow of an opaque object, close to the object, which are not reached by any rays, there will also be points which are reached by rays from part of the source only, and then there will be points which receive rays from the whole source. Those points which do not receive any rays lie in the 'umbra' or shadow proper, while those which receive rays from only a portion of the source lie in the 'penumbra.' Thus, an eclipse of the sun by the moon is *total* at a point of the earth's surface which passes through the shadow cast out into space by the moon obscuring the sun's rays; it is called *partial* at a point on the earth if that point passes through the penumbra only; it is called 'annular' if at any time during the eclipse there can be seen a ring of the sun's surface extending past the moon's disk. 'Pin-hole photography' is another phenomenon which follows at once from the passage of rays in straight lines.

REFLECTION. If rays from a point-source fall upon a reflecting surface, each ray individually will obey the laws of reflection. If the incident rays form a small solid cone symmetrical about the line drawn through the point-source and perpendicular to the surface, they are said to form a 'homocentric' pencil; if, however, the axis of the cone of rays is oblique to the surface, it is called an 'astigmatic pencil.' The rays forming a homocentric pencil after reflection form another such pencil, i.e. they either *converge* to a point on the perpendicular to the surface or *diverge* in such a manner that if the rays be produced back of the surface they will meet in a point on the perpendicular to the surface. This vertex of the cone of reflected rays is called the 'focus' or 'image' of the point-source: it is a 'real' focus or 'image' in the former of the above cases; 'virtual,' in the latter. The rays forming an astigmatic pencil after reflection do not in general have a point focus or image, but have as foci two short straight lines at right angles to each other and a short distance apart: they are called 'focal lines,' and may be either real or virtual. A few special cases will be discussed briefly.

Plane Surface.—Let P M be the section made by the paper of a plane surface perpendicular to the paper; let O be the point surface; O M O′, the perpendicular dropped from O upon the surface; O P, any incident ray; P Q, the reflected ray; S P, a perpendicular to the surface at P; P O′, the continuation of Q P backward. By the laws of reflection the angles O P S and Q P S are equal. Therefore by the laws of geometry the point O′ is at a distance O′ M back of the surface equal to that of the point O in front of it; and further the position of O′ is entirely independent of the direction of the ray O P, and is therefore the same for all rays. Consequently, all rays diverging from O, both homocentric and astigmatic pencils, proceed after reflection at the surface as if they had come originally from the direction of O′. O′ is therefore the virtual image of O. Similarly if an extended object is emitting light toward a plane mirror each point of the object will have a virtual image in the surface at the same distance behind it as it itself is in front of the surface. There will thus be a virtual image of the object of the same size.

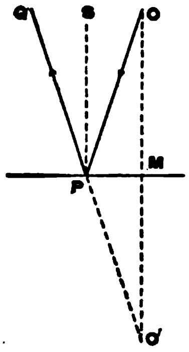


FIG. 1.

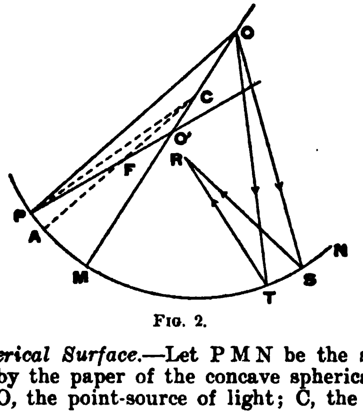


FIG. 2.

Spherical Surface.—Let P M N be the section made by the paper of the concave spherical surface; O, the point-source of light; C, the centre of the sphere of which the surface is part; O C M, the perpendicular to the mirror (i.e. the 'axis' for the point O); O P, any ray of a homocentric pencil; C P, the radius of the sphere drawn to P, and therefore perpendicular to the surface at P; P F O′, the reflected ray; C F A, a line drawn through C parallel to the ray O P. By the laws of reflection, the angles O P C and O′ P C are equal; then by ordinary laws of geometry the point F where the reflected ray O′ P intersects the radius C A divides this radius in two equal parts, and the position of the point O′ on the line O C M is independent of the incident ray provided that P is near M. Therefore all the rays of a homocentric pencil from O form another homocentric pencil on reflection with its vertex at O′: this point is therefore a real focus or image of O. If the distances O M, O′ M, C M are called u, v, r respectively, they are connected by the formula

$$\frac{1}{u}+\frac{1}{v}=\frac{2}{r}.$$

This formula can be shown to apply to any position of the point O and to either a concave or a convex mirror, provided only that the pencil of rays is homocentric.

Let O S and O T be two rays of an astigmatic pencil, and let S R and T R be their reflected rays. They intersect in a point R not on the axis. If a small pencil of rays is considered as falling on an elementary area of the mirror near T and S, the reflected rays will combine to produce a *line* perpendicular to the paper at R and another line lying in the paper across the axis; these are the two 'focal lines,' real in this case.

If all the rays falling on the whole concave mirror are considered, they will form by reflection a bright point at the focus O′, which is the apex of a bright curved surface made up of the focal lines such as was produced at R owing to an elementary area of the mirror. This pointed surface is called the 'caustic' surface. A section of such a caustic formed by reflection at a cylindrical mirror is often seen on the surface of a glass of milk or a cup of coffee. The fact that astigmatic pencils do not bring the rays to the same focus as that of the homocentric pencil is said to be due to 'spherical aberration.'

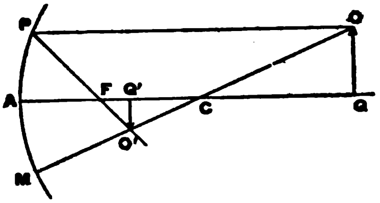


FIG. 3.

If any small object O Q is placed in front of a concave mirror, as shown, its image will be O′ Q′, as is evident from the figure. The image is therefore real, inverted, and diminished in size. The linear size of the image divided by that of the object equals $\frac{r-v}{u-r}$.

REFRACTION. One must distinguish between homocentric and astigmatic pencils in refraction as well as in reflection; for a homocentric pencil of incident rays produces a homocentric pencil of refracted rays, thus giving a point-focus, either real or virtual; and an astigmatic pencil produces, as before, two focal lines at right angles to each other. It should be observed, further, that the index of refraction—and hence the direction of the refracted rays and the positions of the foci—differs for different colors of the light. Light of a definite index of refraction is called light of a 'pure' color or 'homogeneous' light. The indices of refraction with reference to air and for the mean wave-length of white light are given for a few substances in the following table:

Alcohol	**1.36**
Glass, soft	**1.52**
Glass, hard	**1.66**
Water	**1.34**

Several special cases of refraction will be considered.

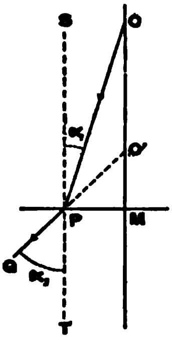


FIG. 4.

Plane Surface.—Let P M be the section of the plane surface by the paper which is perpendicular to it; let O be a point-source of homogeneous light forming a homocentric pencil, of which O P is one of the rays and O M is the axis; let P Q be the refracted ray; S P T be perpendicular to the surface at P; O′ be the intersection of the line O M with the prolongation backward of the refracted ray. Call the angles S P O and T P Q, α_1 and α_2 respectively. By the laws of refraction $\frac{\sin \alpha_1}{\sin \alpha^2}$ is a constant, call it *n;* then by ordinary geometry it can be proved that O′ M = *n* O M. O′ is therefore independent of the direction of the incident ray O P and is the vertex of the refracted homocentric pencil, being a virtual image of O. The diagram is drawn for a case where $n < 1$, e.g. rays emerging into the air from a bright point below the surface of water. If rays emerging from a bright point in air were entering water, $n > 1$ and O′ is farther from the surface than O. If light of a different color had been used, i.e. of a different value for *n*, O′ would have had a different position on the line O M. Thus if light of different colors is emitted from O, there will be a series of colored images along O M. This fact that rays of different colors have different images is said to be due to 'chromatic aberration.' Experiments show that in the case of air and glass, or air and water, blue light is refracted more than green, green more than yellow, yellow more than red.

A pencil of rays incident obliquely on the plane surface is astigmatic and has two virtual focal lines. If in the above diagram the incident ray O P is so oblique that the refracted ray P Q just grazes the surfaces, $\alpha_2 = 90°$, and therefore $\sin \alpha_2 = 1$. Hence $\sin \alpha_1 = n$, or $\alpha_1 = \sin^{-1} n$. If then there should be a ray more oblique than this value of α_1, it would be totally *reflected*, and there would be no refracted ray. This limiting value of the angle of incidence—$\sin^{-1} n$—beyond which all rays are totally reflected is called the *critical angle* for the two given media separated by the surface and for the particular kind of light for which the index of refraction is *n*.

Plate.—A portion of transparent matter bounded by two plane parallel faces forms a 'plate.' A ray in passing through it from the medium on one side out into the same medium on the other side does not have its direction changed although the emerging ray is displaced sidewise.

Prism.—A portion of transparent matter part of whose bounding surface is two plane faces oblique to each other forms a 'prism.' The line in which these two planes meet (or would meet if prolonged) is called the edge of the prism.

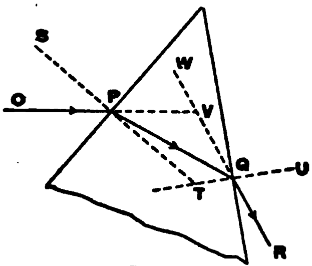


FIG. 5.

Let the paper make a section of the prism perpendicular to its edge, as in the figure. Let the index of refraction of the material of the prism with reference to the surrounding medium be greater than 1, then the path of an incident ray O P will be as shown O P—P Q—Q R, the angles of refraction being such as to satisfy the laws of refraction. The direction of the incident ray is O P V; that of the emerging ray, W V Q R; so the change in direction, or the *'deviation,'* is the angle P V W. This deviation is a function of the index of refraction and therefore of the color of the light; so if there are two incident rays of different color along O P they will have different deviations and on emerging from the prism will be 'dispersed.' It should be noted, however, that prisms of different material, e.g. different kinds of glass, disperse the same colors to different amounts; this is called 'irrationality' of dispersion; and it is owing to this fact that 'achromatic' lenses and prisms are possible. (See ACHROMATISM.) This phenomenon of dispersion may be expressed differently. If O is the source of a pencil of rays, it will have a virtual image owing to refraction at the first surface of the prism; the rays diverging from this image will have a virtual image owing to their refraction at the second surface; so the emerging rays will seem to come from a virtual source on the same side of the prism as O, the actual source. The position of this virtual source varies with the index of refraction of the rays; and different colors will have different virtual sources. So, if O is a source of rays of different colors, there will be a series of virtual sources, one for each color. If the prism is glass and the surrounding medium air, the virtual image of blue light will be closer to the edge of the prism than that of green light, and this is closer than that of red, referring to Fig. 5. This shows that the index of refraction *n* for glass with reference to air is greater for blue than for green, and the index for green is greater than the one for red.

It should be noted that in the case shown in the figure, if O P is the central ray of a cone of rays, they form an astigmatic pencil; and so the virtual source is not really a point, but two focal lines. It may be proved that for one particular direction of the incident ray O P, these two focal lines, due to two refractions, cross at a point and thus give practically a point for the virtual source. This direction is such that the incident and emerging rays, O P and Q R, make equal angles with their respective faces of the prism. For this ray, too, it may be shown that the deviation is less than for all the other rays from the source O; and the angle of incidence or emergence is called the 'angle of minimum deviation.'

A prism offers one of the simplest and best methods for the measurement of the index of refraction with reference to air of a given material for definite colors. It may be proved that if A is the angle between the two faces of the prism and D the angle of minimum deviation for rays of a definite color—both measurable quantities—the index of refraction of the material of the prism for this color is given by the formula

$$n = \frac{\sin \frac{A+D}{2}}{\sin \frac{A}{2}}$$

It is found for all ordinary transparent bodies such as different kinds of glass, water, etc., that as the color is changed from red to yellow, to green, to blue, etc., the index of refraction increases, but at different rates for different bodies. In some bodies this is not so; they are said to exhibit 'anomalous' dispersion.

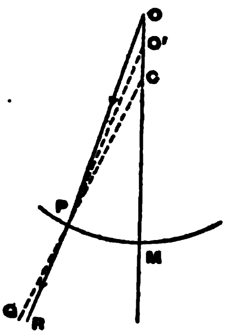


FIG. 6.

Spherical Surfaces.—Let P M be the section of the spherical surface separating two transparent media; let C be the centre of this sphere; O be the source of a homocentric pencil, of which O P is one ray, and for which n is the index of refraction; let C P Q be a perpendicular to the surface at P and PR be the refracted ray, whose prolongation backward is P O'. As before $\frac{\sin a_1}{\sin a_2} = n$, and by geometry it may be shown that O' is the virtual image of O, where O' lies on the line O C M which passes through the centre of the spherical surface, and the distance O' M is such that

$$\frac{n}{O'M} = \frac{1}{OM} + \frac{n-1}{CM}$$

LENSES. A portion of transparent matter bounded by two spherical surfaces and symmetrical about the line joining their centres is called a 'lens;' this line of symmetry is called the 'axis.' A homocentric pencil of homogeneous rays from any point on the axis gives rise after two refractions to another homocentric pencil with its vertex on the axis. If the source of rays is O, at a distance u from a thin lens, the image O' will be at a distance y on the opposite side of the lens, where u and y are connected by the relation

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

f being a constant depending on the radii of the two surfaces of the lens and its index of refraction for the particular rays. O and O' are 'conjugate foci.' If O' is the real image of O, then O will be the image of O' as a source of rays. (If in this formula, on substituting for u and f their values, v is a negative quantity, O' is on the same side of the lens as O.) There are two classes of lenses; for one, f is positive; and for the other, f is negative.

(1) f is essentially positive.—As a special case let O be at an infinite distance, i.e. $u = \infty$, and all the rays from O are lines parallel to the axis. Therefore $v = f$, a positive quantity; and O' is on the opposite side of the lens at a distance f. This point is called the 'principal focus' on that side; and all rays on the other side parallel to the axis pass through this focus after refraction through the lens; for this reason a lens of this kind is called a 'converging' one. Similarly, if $u = f$, $v = \infty$; i.e. all rays passing through a point on the axis at a distance f from the lens emerge on the other side of the lens parallel to the axis. There are thus two principal foci at equal distances from the lens on its two sides. Again, any ray through the point where the axis cuts the lens has its direction unaltered, because at this point, which is called the 'centre' of the lens, the two surfaces of the lens are parallel and close together, assuming that the lens is thin. These principles enable one to trace at least three rays leaving a point, and thus to find its image and to draw images for any point or for any object as formed by such a lens. Drawings are given for a few special cases:

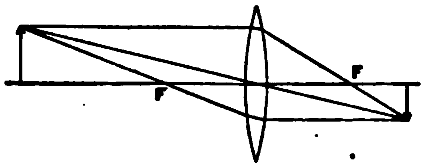


FIG. 7.

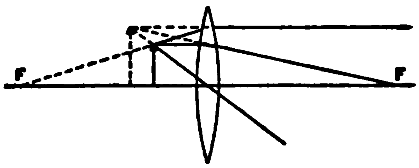


FIG. 8.

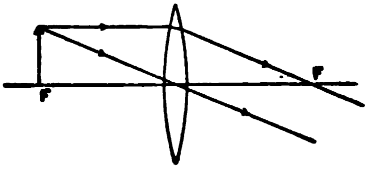


FIG. 9.

It is evident from the formula that if $u < f$, $v < 0$ and the image is virtual as shown in Fig. 8. In this case the image is magnified. The plane perpendicular to the axis at a principal focus is called a 'focal plane.' If an object lies in this plane, as shown in Fig. 9, the image of each of its points lies off at infinity, as appears from the fact that the rays are parallel after leaving the lens. Conversely, parallel rays falling upon a lens for which f is positive converge after passing through the lens to that point in the focal plane through which passes that one of the parallel rays which cuts the lens at its middle point or centre.

(2) f is essentially negative.—As a special case let O be at an infinite distance, i.e. $u = \infty$ and all the rays from O are lines parallel to the axis.

Therefore $v = f$, as a negative quantity; and O′ is on the same side of the lens as O at a distance f from the lens. This point is called a 'principal focus;' and there is evidently another one on the other side of the lens at the same distance from it. Therefore all rays parallel to the axis on one side of the lens *diverge* after passing through the lens as if from a point at a distance f from the lens on the same side as were the parallel rays. For this reason a lens of this kind is called a 'diverging' one. Similarly, a ray on one side of the lens pointed toward the principal focus on the farther side emerges from the lens parallel to the axis. Further, a ray through the centre of the lens remains parallel to itself. These principles enable one to trace at least three rays leaving a point not on the axis and thus to find its image, and to draw images of any object. Drawings are given of a few special cases.

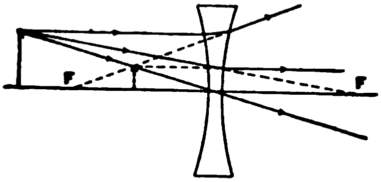


FIG. 10.

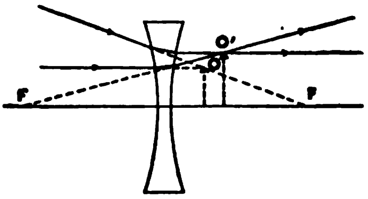


FIG. 11.

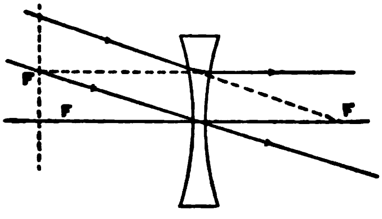


FIG. 12.

It is evident from the general formula that v will be positive, i.e. there will be a real image if u is negative and numerically less than f, i.e. if O is on the opposite side of the lens from that on which the rays enter, and between the lens and the principal focus. This is the case when the entering rays are converging toward the point O, as shown in Fig. 11; under these conditions O would be called a 'virtual' source. Again, as is seen from Fig. 12, parallel rays falling on the lens emerge as if coming from that point in the focal plane on the same side as that from which the rays come where the ray through the centre of the lens meets the plane.

If two thin lenses of focal lengths f_1 and f_2 are put close together with their axes coinciding, they form a lens whose focal length, f, is given by the formula

$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}.$$

If the two lenses are at a distance d apart, the focal length of the combination f is given by the formula

$$\frac{1}{f} = \frac{1}{f_1 + d} + \frac{1}{f_2}.$$

If the lens is not thin, but so thick that this fact must be taken into account, it may be proved that there are two planes perpendicular to the axis, either in the lens or near it, which are so placed that if u is the distance from the source O to one plane and v that from the image O′ to the other, the same formula as before applies. These planes are called the 'principal planes.' They have other important properties also; but for a full discussion of thick lenses and their combination reference must be made to some treatise on optics.

Lenses and systems of lenses as used in microscopes, telescopes, photographic lenses, etc., are subject to the following—among other—imperfections:

(1) *Spherical Aberration.*—An oblique ray from a point on the axis does not pass through the same focus as does a homocentric pencil.

(2) *Curvature of Field.*—The image of a large plane figure perpendicular to the axis will not be formed on a plane, but on a curved surface.

(3) *Distortion.*—The image of a large object, e.g. a building, is not similar in all its parts to the parts of the object; the magnification may be different and a rectangular portion of the object may appear in the image with curved edges.

(4) If the image of a small plane area perpendicular to the axis is formed by a lens which is large compared with the object, the image is not a small plane area perpendicular to the axis unless Abbe's 'sine formula' is satisfied. If the system satisfies this condition, it is called *aplanatic.*

(5) *Chromatic Aberration.*—Owing to the fact that the index of refraction differs with the color of the light, there are different focal lengths for rays of different color; and, further, if the lenses are thick, the magnification is different also. See ACHROMATISM.

Many of these imperfections can be avoided by a suitable choice of material for the lenses, by proper curvature for the lens-surface, and by using suitable combinations of lenses. Lens combinations which are free from certain errors are called special names. A photographic lens free from distortion of field is called 'orthoscopic;' one free from curvature of field and from chromatic and spherical aberrations is called 'anastigmatic;' a microscopic objective free from secondary spectra of chromatic aberration and aplanatic for several colors, 'apochromatic.'

Several facts should be borne in mind in regard to an optical combination: (1) The intrinsic brightness of any surface cannot be increased by any optical means. The natural brightness of any object—that is, the light received per square centimeter of the image on the retina of the eye when looking directly at the object—is as great as the brightness when looking at the object through a telescope or microscope. (2) The brightness of a star or point-source may, however, be increased by using a telescope, because by means of it more light is brought into the eye; the increase is in general proportional to the ratio of the area of the object-glass of the telescope to that of the iris of the eye. (3) No amount of magnification will enable one to 'resolve' two point-sources—that is, to see them as two separate objects—if they are as close together as a certain fraction of the wave-length of the light which they are emitting. This fact depends upon the properties of diffraction of the ether-waves, and will be discussed later. For detailed description of various optical instruments, see the articles MICROSCOPE; TELESCOPE; SPECTROSCOPE, etc.

PHYSICAL OPTICS.

In this branch of light the assumption is made that the sensation called light is due to the reception into the eye of trains of waves. A 'source of light' is then a source of waves, which are propagated from the source to the eye—or to whatever instrument is used to detect their presence—and produce there certain effects. The phenomena to be considered are then: (1) the fact that trains of waves carry energy; (2) the fact that waves are propagated with a finite velocity; (3) the kinematic properties of composition of wave-motion.

PHOTOMETRY (q.v.) is that division of 'light' which is concerned directly with the comparison of quantities of light emitted by various sources and received by different bodies. If a point-source emits in all directions a 'quantity of light' M, its 'intensity' is said to be $M/4\pi$, i.e. the quantity of light going out through a unit solid angle. This intensity is written I. A small surface of area A, at a distance r from the point-source, and inclined to the line joining it to the point-source so that the angle between this line and a line perpendicular to the surface is θ, receives therefore an amount of light $\frac{IA\cos\theta}{r^2}$. The intensity of 'illumination' of this surface is the amount of light per square centimeter; it is written E. Hence $E = \frac{I\cos\theta}{r^2}$. Therefore the illumination varies directly as the intensity of the light, inversely as the square of the distance, and as the cosine of the obliquity of the surface.

VELOCITY OF LIGHT. The fact that time is required for the propagation of whatever it is that causes light has been known since the observation of Roemer on the eclipses of Jupiter's satellites in 1675. It follows then—granting that light is due to wave-motion—that there is a medium filling all interstellar space, which serves to convey these waves. This medium is called 'the ether' (q.v.), and it is evident from the properties of transparent bodies that it permeates them, and may in fact be regarded as a universal medium. There is every reason, both theoretical and experimental, for believing that the velocity of waves of all lengths is the same in the pure ether, e.g. in interstellar space; but inside of ordinary matter the velocity of ether-waves varies with the wave-length, and of course their velocity is different in different media. It will be shown below under *Refraction* that the index of refraction of one medium with reference to another for a definite color is the ratio of the velocity in the second medium of these ether-waves which correspond to that color to that of the same waves in the first medium. There are two experimental methods for the determination of the velocity of ether-waves in air—or, as often expressed, the 'velocity of light' in air. One depends upon the use of a toothed wheel, which is made to revolve rapidly in front of a source of light, thus allowing intermittent flashes of light to be seen through the teeth. These waves coming through the gaps between the teeth traverse a considerable distance—several miles—fall upon a mirror which reflects them back in their original direction. If on their return to the wheel the latter has turned so far that they strike a tooth, they are stopped; if, however, the wheel has turned farther so that they find an opening between the teeth, they will pass through and their return may be observed by suitable means. If the speed of the wheel is thus exactly right, the waves passing out through one opening will return through the next; if the speed is now increased, the returning waves will be stopped by a tooth; if the speed is still further increased, the waves passing out through any one opening will return through the next but one, etc. Therefore, if the speed of the wheel, the size of the teeth, and the distance between the wheel and the mirror are known, the velocity of the waves may be calculated. This method is due to Fizeau and has been used by him, by Cornu, by Forbes and Young, and more recently by Perrotin. The other method consists in allowing light from a narrow slit to fall upon a mirror, be reflected to another distant mirror which reflects it back to the first mirror and thus back to the source. This first mirror is not stationary, however, but is made to revolve rapidly; so that, when the waves return from the distant mirror, the angles of incidence and reflection are not quite what they were before, and so the waves are not reflected directly back to the slit-source, but are deflected slightly. If the amount of this deflection, the distance apart of the two mirrors, and the rate of revolution of the rotary mirror are known, the velocity of the waves may be calculated. This method is due in part to Fizeau also, but in the main to Foucault. It has been used by the latter, by Michelson, and by Newcomb. For several reasons this method is not as good as that of the toothed wheel. (See Cornu, *Reports of International Congress of Physics*, Paris, 1900, vol. ii., p. 225.) The accepted value for the velocity of light in air is 300,000 kilometers or 3×10^{10} cm. per second, with a possible error of less than one part in 1000. This is about 186,600 miles per second. Foucault showed by direct experiment that the velocity of light in air is greater than that in water, an observation which definitely overthrows Newton's corpuscular theory of light.

HUYGENS'S PRINCIPLE. To show how the properties of rays, which were assumed as the basis of geometrical optics, are consequences of the propagation of ether-waves, use must be made of a theorem in kinematics known as 'Huygens's principle.' As a result of disturbances in any medium which can transmit wave-motion there will be at any instant a definite wave-front—that is, a surface which is the locus of all points just reached by the spreading waves; there will be no effect at any point ahead of the wave-front until it is reached; but Huygens's principle asserts that we can predict what will be the effect at that point if we assume that each minute portion of the medium in the wave-front is a centre of spherical waves. These spherical waves spreading out from each point of the wave-front all start in the same phase; but, as they overlap and are superimposed at the point for which the effect is to be predicted, they will be in different phases depending upon the distances from this point to the various point-sources. The entire effect at the point due to the compounding of these 'secondary waves' is, in accordance with Huygens's principle, exactly the same as that due to the advance of the original wave-front. This principle of Huygens has been perfected so as to give the proper amplitude and phase for the resulting motion, and serves as the basis for the explanation of all the purely optical phenomena of light. It will now be shown how this principle explains the properties of rays.

Rectilinear Propagation. A point-source of waves produces a spherical wave-front in an isotropic medium, because the velocity is the same in all directions. Let O be such a point-source of waves; NM the section by the paper of the spherical wave-front at any instant; P is some point in front of the wave-front; M is the intersection of the wave-front by the line OP. When it is said that light travels in a straight line, it is equivalent to saying that, if an opaque obstacle is placed with its edge at the point M, its shadow will just include P. It can be shown that the principle of Huygens predicts that this statement is not quite accurate; and more careful experiments prove that the modifications suggested are observed. Instead of considering all the infinite spherical secondary waves, proceeding from the surface NM to P, the disturbances may be grouped together according to a manner devised by Fresnel. Call the distance PM a, and let the wave-length of the waves be λ; then with P as a centre draw spherical surfaces of radii $a+\frac{\lambda}{2}$, $a+\lambda$, $a+\frac{3\lambda}{2}$, etc. These surfaces will intersect the spherical wave-front in circles which will thus include zones between them, the distinguishing characteristic of a zone being that any point in it lies at such a distance from P that there are points in the two contiguous zones for which the distances to P differ from it by half a wave-length. Consequently, if the continued effect of the action of all the secondary waves from the points of any one zone is to produce action in one direction, the resultant action due to both the neighboring zones is in the opposite direction. Let the numerical values of the effects at P due to the different zones be m_1, m_2, m_3, etc., for the first or central zone around M, the second, third, etc. The final numerical value of the action of the secondary waves is, therefore,

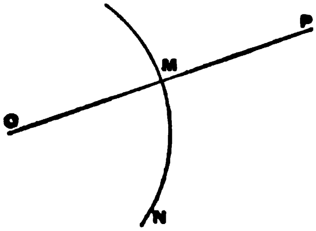


Fig. 13.

$$m_1 - m_2 + m_3 - m_4 + m_5 - \text{ etc.}$$

The value of m for any zone depends upon three things: the area of the zone, the distance of the zone from P, and the inclination of the line joining P to the zone with the line PMO. It may be shown that owing to these causes the value of M for any zone is less than that for the one just inside; and, if the wave-length is small, as it is in the case of ether-waves (and also for the waves produced in air by very shrill sounds), this difference between the numerical values of the action for the zones is small. Under these conditions the above sum $m_1 - m_2 + m_3 -$ etc., reduces to simply $\frac{1}{2}m$. In words, the action at P owing to the secondary waves from any one zone is neutralized by that of the waves from one-half of each of the neighboring zones; and so the final action at P is one-half of that due to the secondary waves from the central zone around M. If the wave-length is extremely small, as in ether-waves, the areas of these zones are almost infinitesimal; but if the wave-length is long, as in aërial waves, they have a sensible size. If the action of the central zone is blotted out by an opaque obstacle, the action at P due to the rest of the wave-front spreading out from the source at O is $m_2 - m_3 + m_4 -$ etc., or $\frac{1}{2}m_2$, and is therefore hardly changed at all, if the zones are small. If the obstacle blots out two zones, the action at P is $\frac{1}{2}m_3$; etc. Consequently, if any small circular opaque disk is placed at M at right angles to the radius, there is always action at P, and its value is one-half that due to the first zone outside the edge of the disk. Naturally as a larger and larger disk is used the intensity of the action at P decreases. Similarly, if an opaque screen with a circular opening is placed at M, the effect at P depends upon the area of the opening. If this area is that of the first zone, the action at P is twice what it would be if the screen were entirely removed; if the area includes two zones, there is practically no action at P; etc.

If the opaque screen has zonal openings so as to expose only the odd zones, the effect at P is $m_1 + m_3 + m_5 +$ etc., and so is very intense. If this 'zone-plate,' so called, is modified so that the opaque rings are replaced by transparent rings of such a thickness as to introduce a difference of half a wave-length by virtue of the fact that the velocity of light in the transparent material is less than in air, all the zones will conspire to help in the action at P. It is evident that the size of the zones varies with the color of the light; and if white light—or a mixture of colors—is coming from the source, passing either through a small circular opening or around a small circular disk, there will be colored effects near P. All of these effects with openings and disks are amply verified by experiments with both ether and aërial waves, the only difference coming from the fact that the aërial waves are as a rule many centimeters long, while the ones in the ether that affect our sense of sight have a length of about 0.00005 of a centimeter.

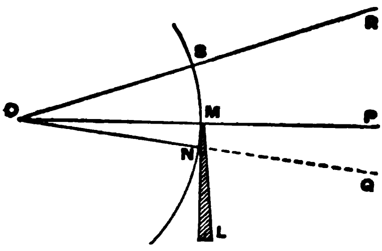


Fig. 14.

If a large opaque screen ML is placed near a point-source (O) as in Fig. 14, rays drawn grazing its boundary form what is called the 'geometrical shadow.' Thus if OMP is one of these rays, the shadow lies on one side of it. The effect at a point Q just within the shadow can be found by considering the zones on the wave-front around N, which correspond to Q. It is evident that there is an action at Q due to those zones which are not obscured by the obstacle. As points are taken farther and farther in the shadow, however, this effect becomes less and less, gradually fading away. (This explains why aërial waves pass around corners into the 'shadow,' and asserts the same phenomena for ether-waves, only to a much less distance, owing to the smallness of the zones in their case. This is actually observed.)

Similarly, the action at a point R outside the shadow depends upon the number of zones drawn around S, the intersection of OR with the wave-front, which are not obscured by the opaque obstacle. If R is very close to P, only the first zone may be uncovered, and the action is intense; but as R recedes from P the second zone begins to neutralize the action of the first, and so the intensity at R decreases; then, as R continues to recede, the action again increases, etc., until R is so far away from P that the action of the zones of high order makes no difference. Consequently, if homogeneous light is used, and a screen is placed to receive the shadow, there will be no sharp shadow, but the light will gradually fade away in the geometrical shadow, while outside this shadow there will be bright and dark bands following the general shape of the obstacle. These phenomena can be easily observed. If white light is used, these rings will be colored, because their position depends upon the wave-length and so each color will have its own set of rings; but at a comparatively short distance from the edge of the geometrical shadow the effect is a uniform white illumination. These bands are called 'diffraction' bands; and the whole phenomenon is said to be due to 'diffraction' (q.v.), as is also that of the small disks and openings.

These diffraction rings or bands are seen most clearly if the opaque obstacle has a linear edge like a knife edge and if it is illuminated by light coming through a *slit* parallel to this edge; then, if the light is received on a screen suitably placed, the bands will be most distinct. Other cases of diffraction will be discussed later.

It thus appears that the sense in which light travels in straight lines is not in the casting of sharp shadows, for it does not, but in the fact that as ether-waves spread out from a point-source O, there being no obstacles, the effect at a point P is due entirely to the action of a minute portion of the wave-front around M where the ray OP intersects it.

LAWS OF REFLECTION. It is not difficult to show that the laws of reflection are a direct consequence of the principle of the rectilinear propagation of light. Let AB′C′A′ be the section of a plane surface by the paper; draw the line ABC to represent the section of a plane by the paper, and similarly the line A′C″B″, making the angles CAA′ and C″A′A equal; draw the lines CC′ and BB′ perpendicular to the plane ABC and the lines C′C″ and B′B″ perpendicular to the plane A′C″B″; draw also B′P perpendicular to CC′ and C′Q perpendicular to B′B″. If the plane A′C″B″ represents a wave-front receding from the plane surface AB′C′A, the actions at B″ and C″ are entirely due to those that were at B′ and C′ a short time previously; similarly, if the plane ABC represents an advancing wave-front, the actions at B′ and C′ will be due to those now at the points B and C. Therefore if the time taken for the disturbance to pass from B to B′ to B″ is the same as it is for the disturbance to pass from C to C′ to C″, the receding wave-front is due to the reflection at the surface AB′C′A′ of a wave-front which was at ABC some time previously. But these times are the same because the lengths of the lines CC′C″ and BB′B″ are evidently equal by geometry, and the medium in which the disturbances are traveling is the same for both. Consequently, the ray BB′ is reflected into the ray B′B″; they make equal angles with a line drawn perpendicular to the surface at B′ and these lines lie in one plane.

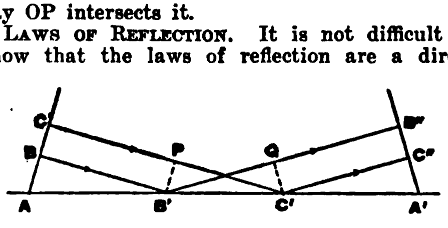


FIG. 15.

LAWS OF REFRACTION. In a similar manner the laws of refraction may be deduced. Let AB′C′A′ be the intersection of the paper with a plane surface separating two transparent media; let ABC represent the section of the paper with a plane in one medium, and A′C″B″ with a plane in the lower medium; draw BB′ and CC′ perpendicular to the former and B′B″ and C′C″ perpendicular to the latter, also B′P perpendicular to CC′ and C′Q perpendicular to B′B″. If ABC is an advancing plane wave-front, the action at B′ is due to that at B, and at C′ to that at C; and, if A′C″B″ is a receding wave-front, the action at B″ is due to previous action at B′ and that at C″ to previous action at C′. Therefore the wave-front A′C″B″ will be that due to the refraction of the wave-front ABC, provided the times taken for the disturbances to pass from B to B′ to B″ and from C to C′ to C″ are the same. This will be true if PC′ bears the same ratio to B′Q that the velocity of the waves in the first medium (v_1) does to that in the second (v_2). That is, the condition is that

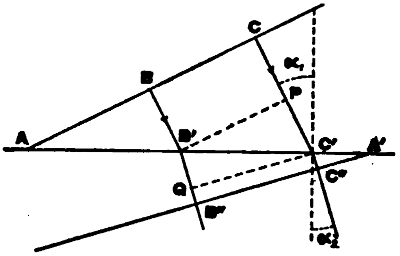


FIG. 16.

$$\frac{PC'}{B'Q} = \frac{v_1}{v_2}$$

But PC′ = B′C′ sin (C′B′P) and
B′Q = B′C′ sin (B′C′Q)
and the angle C′B′P = α_1, and the angle B′C′Q = α_2. Hence the condition becomes

$$\frac{\sin \alpha_1}{\sin \alpha_2} = \frac{v_1}{v_2}$$

The velocity of any homogeneous train of waves in any one medium is constant (but varies with the medium); therefore for any such train of waves $\frac{v_1}{v_2}$ is a constant and may be written *n* as before, the index of refraction of the second medium with reference to the first. Thus it is seen that the incident ray CC′ becomes C′C″ by refraction, that they lie in a plane which includes the perpendicular to the surface at C′, and that their angles of incidence and refraction are given by the formula $\frac{\sin a_1}{\sin a_2} = n$, where *n* is a constant for any one train of waves. Thus *n*, and therefore the velocity of ether-waves, may be found to vary both for different colors in one medium and for the same color in different media. Since it has been shown that in ordinary matter *n* increases as the color is changed from red to yellow, to green, to blue, etc., it is evident that the velocity of those waves which produce the sensation red—'red waves'—is greater in ordinary matter than is the velocity of 'green waves,' etc. For if the first medium is the pure ether and the second air (or glass, or water), v_1 remains constant for all waves, and if *n* increases it must be because v_2 decreases.

Double refraction is at once explained if the assumption is made that, whereas a point-source in an isotropic medium produces a spherical wave-point, in media which have different properties in different directions a point-source produces a more complicated wave-front. To explain the simpler case of double refraction, that where one ray obeys the ordinary laws of refraction, Huygens assumed that the wave-front was a combination of a sphere and an ellipsoid of revolution, the axis of revolution being a diameter of the sphere. In bodies of this nature there is always one direction in which they behave in all respects like ordinary transparent bodies. This is called the 'optic axis,' and it is evidently in the direction of the axis of revolution of the ellipsoid of the wave-front. (It is not a *line*, but a direction; and so all lines drawn in this direction within the body are optic axes.) These bodies are therefore called 'uniaxial.' Let such a body have a face cut and polished making an angle θ with the optic axis, and let the paper make a section perpendicular to this face and including the optic axis. If a plane wave-front ABC is incident on this face, the disturbance at A in the uniaxial body sends out its double wave-front, the section of which—a circle and an ellipse—is shown; and while the disturbance goes from C to C′ in the air let the double wave-front advance as shown. Then at this instant the wave-fronts in the uniaxial body may be easily seen to be planes which pass through the line perpendicular to the paper at C′ and are tangent to the sphere and to the ellipsoid. The disturbance from A has thus reached the points of tangency O and E, AO and AE are called the ordinary and the extraordinary *rays;* and it is evident from geometry that the latter ray does not in general obey either of the laws of ordinary refraction. Two lines drawn perpendicular to the wave-fronts, e.g. B′O′ and B′E′, are called the wave 'normals;' and it is seen that in general the extraordinary ray does not have the same direction as the extraordinary wave-normal, i.e. the ray is advancing in a direction different from the direction of advance of the wave-front. In other doubly refracting bodies there are two optic axes; such are called 'biaxial.' Fresnel explains their optical properties by assuming a peculiar kind of wave-surface, which is too complicated for description here.

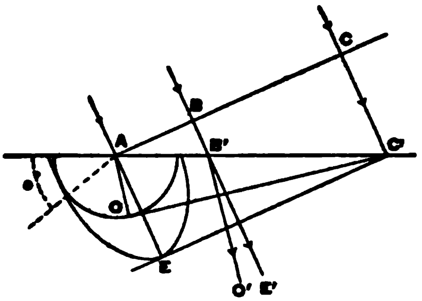


FIG. 17.

The wave-surface of Huygens for uniaxial bodies may be regarded as definitely established by experiment; while all that can be said in regard to Fresnel's wave-surface for biaxial bodies is that it is most probably correct.

INTERFERENCE AND DIFFRACTION. The optical phenomena whose discovery established the fact that light is due to wave-motion are those of 'interference' (q.v.) so called. The simplest illustration of these is due to Thomas Young and is called after him. Three opaque screens are arranged in order; in the first there is a narrow slit at O, illuminated with some homogeneous light, e.g. a flame burning sodium; in the second there are two slits, O_1 and O_2, close together parallel to the first and at equal distances from it; the waves spreading out from O illuminate the slits O_1 and O_2 so that they in turn become sources of *two identical* trains of waves—if the source at O flickers or changes in any way, both the secondary sources change together; waves from these two sources illuminate the third screen. Bands parallel to the slits alternately dark and colored, are observed on this screen. These may be explained immediately if light is due to wave-motion; because at points on the screen such that their distances to O_1 and O_2 differ by half a wave-length or by an odd number of half wave-lengths there will be complete interference, and consequently darkness. Similarly at points on the screen whose distances from the slits O_1 and O_2 differ by a whole number of wave-lengths the two trains of waves will reinforce each other, and there will be light. (It is evident that there is no destruction of energy—only a redistribution of it.)

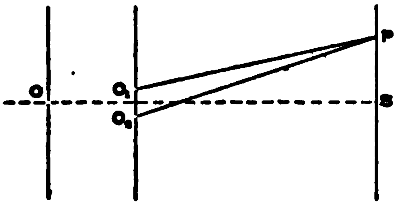


FIG. 18.

Referring to the figure, if P is a point in a bright band $O_2P - O_1P = N\lambda$, where N is any integer number, 0, 1, 2, 3, etc., and λ is the wave-length of the waves. If the distance from the receiving screen to the one with the two slits is a; if the distance apart of the two slits is b — a small quantity compared with a; and if PS is x, also a small quantity, it is seen by geometry that

$$\frac{x}{a}=\frac{O_2P-O_1P}{b}$$

Hence $N\lambda = \frac{bx}{a}$; and the distance apart of the bright bands is therefore $\frac{a\lambda}{b}$. This distance, and both a and b, can be measured; so this experiment gives a means of determining λ. It is found that as the colors change from red to yellow to green to blue the wave-length of the corresponding waves becomes less. If white light is used, the central band at S is white, but the others are colored, all merging into each other. The wave-length of the yellow light from a sodium flame is found to be 0.00005893 cm. Since the velocity of the waves is 3×10^{10} cm. per second, the wave-number for these 'yellow waves' is about 5×10^{14}. This is the number of vibrations per second of the atom of sodium. (For other wave-lengths, see SPECTROSCOPY.) It is thus possible now to compare the indices of refraction of a given material—e.g. water—with the corresponding wave-lengths. A curve plotted with the indices of refraction as ordinates and the wave-lengths as abscissæ is called the 'dispersion curve' of the substance. There are many other ways of securing two identical slits as sources of light than the one here described, e.g. Fresnel's bi-prism and double mirror; but for a full description reference should be made to some treatise on light.

One of the most interesting phenomena depending for their explanation upon interference is that of the color of 'thin plates' and of Newton's 'rings,' as shown in the colors of soap-films, very thin films of glass, or when a convex glass lens is pressed closely against a piece of plane glass. When parallel rays of light are incident upon a transparent film of uniform thickness, that portion which comes back, at the proper angle of reflection, is a mixture of waves which have suffered reflection at the top surface of the film and those which, having entered the film, have been reflected at the lower surface and then have emerged directly at the top surface or emerged after a series of internal reflections. If the relative retardation of the component trains of homogeneous waves is such that they have different phases equivalent to a difference of an odd number of half wave-lengths, there will be complete interference; and it can be shown that all the waves have been transmitted through the film, so there is no loss of energy. If, therefore, the incident light is white, those waves will be absent from the reflected beam which satisfy the above condition; and so it will appear colored. It is proved easily that if the thickness of the film is e, its index of refraction with reference to air μ, and the angle of incidence of the light or the lower surface of the film α, there will be complete interference in the reflected light for a train of waves whose wave-length in the film is λ if

$$N\lambda = 2e\mu\cos\alpha,$$

where N is any whole number.

It is evident that the transmitted light is in any case complementary to that reflected; but there will always be differences in the apparent brightness of the colors, because there is so much white light transmitted.

If the film is of varying thickness, there will be different colors corresponding to the values of λ which satisfy the above equation for different values of e, the thickness. If homogeneous light —all of one color—is used, there will be seen colored bands separated by dark ones, depending upon the fact that the above equation is satisfied by different values of N (0, 1, 2, 3, etc.) for the same value of λ, if e is varying. The colored effects seen with white light depend upon the superposition of these colored bands due to the components of white light. It should be noted, however, that in order to see these colored bands the eye must be focused on the *surface of the film*, and a comparatively large source of light must be used. This is the explanation of Newton's rings.

If the film has perfectly parallel plane faces and is illuminated by a large source of homogeneous light (e.g. a flame), colored *rings*, separated by dark ones, may be seen by looking through the film at the source, the eye being focused for *an infinite distance*. These same rings may be seen to better advantage if a telescope focused for infinity is used to view the light. It is in this manner that the 'interferometers' of Michelson and of Fabry and Perot are used. The colors obtained in Lippmann's method of color photography (q.v.) depend upon this principle of thin plates. The colors of the opal are due to similar causes. If a soap-bubble could be imagined crushed and crumpled up, the colors would be like those of the opal.

There are two cases of diffraction which deserve special attention; one is when light with a plane wave-front falls upon a single rectangular or circular opening; and the other is when waves with a plane wave-front fall upon a series of rectangular openings regularly or irregularly spaced.

(1) *Diffraction Through a Rectangular Opening.* —If homogeneous waves with a plane wave-front fall upon such an opening of width b and are then brought to a focus on a screen by a converging lens, it is observed that the illumination on the screen consists of a narrow band of light fading away into two dark lines, on the farther sides of which come two faint bright lines, etc., the central bright line being much more intense than the successive lines. This is called a 'diffraction pattern.' If f is the focal length of the lens, the distance from the centre of the central light band to the centre of the neighboring dark band is $f\frac{\lambda}{b}$. This is illustrated by light from a distant star passing through a rectangular opening. If light from another star apparently near the first passes through the same opening, its diffraction pattern will be the same as for the former, but shifted slightly sidewise. If the angle between lines drawn from the slit to the two stars is α, the pattern will be shifted sidewise a distance equal to f and α. If this amount of shift brings the maximum bright band of one pattern to coincide with the minimum of the other, the resultant diffraction pattern will be such that it is *just possible* to distinguish the presence of two patterns. If the pattern is shifted less, it is impossible to recognize the presence of the two. The limiting close-

ness of the stars—so far as their angular separation is concerned—is then when

$$f\tan\alpha = \frac{f\lambda}{b}$$

or since α is very small, when

$$\alpha = \frac{\lambda}{b}.$$

This is called the 'resolving power' for a rectangular opening of width b.

Similarly when a circular opening is used, the diffraction pattern consists of a bright spot fading rapidly into a dark ring, then a faint ring, a dark ring, etc.; and if the diameter of the opening is d its resolving power may be shown to be

$$\alpha = 1.22\frac{\lambda}{d}.$$

Similarly, if two point-sources are at a distance x apart and are at such a distance from a lens that the angular aperture of the lens as seen from either point is θ, the lens cannot 'resolve' the points if x is so small that

$$x\sin\frac{\theta}{2} = \frac{\lambda}{2}.$$

This determines the resolving power of a microscope. The greatest value θ can have is 180°, and under these conditions $x = \frac{\lambda}{2}$.

(If the two points are in a medium whose index of refraction with reference to air is n—e.g. oil immersion microscopes—this limiting distance is $x = \frac{\lambda}{2n}$.)

(2) *Diffraction Through a Series of Parallel Rectangular Openings Regularly Spaced*, that is, a 'grating.' (See DIFFRACTION AND DIFFRACTION GRATINGS.) If the width of each opening is b and of each opaque strip separating the openings is a, the sum $(a + b)$ or e is called the 'grating-space.' In general these gratings are made by ruling lines by means of a diamond point on a glass plate. Where the diamond makes scratches the surface is rendered opaque, and the spaces in between are transparent slits. An equally good arrangement is to rule lines on a polished metallic mirror, and use it as a reflecting grating. As a rule the grating-space is made very small, there being as many as 15,000 or 20,000 lines to the inch. (See DIVIDING ENGINE.) If homogeneous waves with a plane wave-front are incident upon a grating at such an angle that the perpendicular to the wave-front makes an angle i with the perpendicular to the grating, the waves diffracted through the openings will be broken up into beams leaving the grating in such direction as to make with the perpendicular to the grating angles given by the value of θ in the formula

$$N\lambda = e(\sin i + \sin\theta),$$

where N is any whole number, 0, 1, 2, 3, etc., positive or negative. The simplest case is when the incident light is perpendicular to the grating, that is $i = 0$; hence

$$\frac{N\lambda}{e} = \sin\theta.$$

The best method of observing these diffracted beams is to focus them upon a screen by means of a lens. The diffraction pattern will be a series of bright bands corresponding to the above formula, with other faint maxima and minima unless the grating-space is small. If this is the case, the subsidiary maxima disappear and the bright bands shrink up into fine lines, the smaller the grating-space the narrower these lines of light. Thus there will be lines of light for $\theta = 0$, $\theta = \sin^{-1}\frac{\lambda}{e}$, $\theta = \sin^{-1}\frac{2\lambda}{e}$, etc.; that is, there is a central line and others on each side of this, forming what are called the first, second, etc., spectrum according as $N = 1, 2$, etc. The grating-space can be measured; the order of the spectrum is known in any particular case; θ can be measured by a goniometer, and so the wave-length of the ether-waves may be determined. This is one of the most accurate methods known for the measurement of the wave-lengths of ether-waves.

If white light is used, each component train of waves will have its own maxima at definite angles; and so the light is analyzed into its parts, forming a central white image and series of colored spectra on each side. It may be shown that if m is the entire number of grating-spaces and if two trains of wave of wave-length λ and $\lambda + \Delta\lambda$ (where $\Delta\lambda$ is small) are viewed in their spectra of the Nth order, they will have bright lines so narrow as to be separate enough to recognize the existence of both if $\Delta\lambda = \frac{\lambda}{mN}$. $\frac{\lambda}{\Delta\lambda} = mN$ is defined to be the 'resolving power of the grating.' A spectrum in which each train of waves of a definite wave-length is represented by a 'line' of light as fine as possible is called a 'pure' spectrum.

When diffraction through a great number of equal parallel slits irregularly spaced takes place, it may be shown that the effect is simply that of a single slit, only greatly intensified. Similarly, if a great number of circular openings of the same size or of circular disks of the same size are placed at random in front of a point-source of light, the diffraction pattern is simply that due either to a single opening or to a single disk. The color halos around the moon are in certain cases due to the diffraction past circular disks of floating drops of water.

POLARIZATION. All the phenomena so far discussed depend for their explanation upon the assumption that light is due to wave-motion; and therefore similar ones may be observed with all kinds of wave-motion; for instance, aërial waves may be reflected, refracted, and diffracted, and may be made to interfere. But there are certain other phenomena in the case of light which establish the fact that the ether-waves which produce light are *transverse*, that is, the vibration in the ether is at right angles to the direction of advance of the waves. In other words, the vibration in the ether is in the wave-front as the waves advance in the pure ether or through isotropic material bodies. This may be proved in several ways. Perhaps the simplest is this: cut two identical plates of a crystal of tourmaline; let ordinary white light from the sun or from a lamp pass through one of these plates and then let it fall perpendicularly upon the other; if this second plate is turned slowly around an axis parallel to the rays of light, it will be noticed that, during one complete revolution of the plate through 360°, there are two positions differing by 180° for which no light emerges from the second plate, while half way between these two positions the emerging light has its maximum intensity. This observation can be accounted for only if it is assumed that, after the waves have emerged from the first plate, the vibrations in the ether are all in parallel straight lines perpendicular to the direction of the rays, the direction of the vibration being in some way connected with the properties of the crystal of tourmaline; this means that the crystal transmits vibrations in a definite direction only, which is fixed by its crystalline properties.

Similarly, the second crystal will transmit only those vibrations which are in straight lines parallel to some line fixed by its crystalline properties. If, therefore, the waves incident upon the second plate have their vibrations parallel to this fixed direction—and this will happen twice in one complete revolution of this plate around an axis parallel to the rays—the waves will be entirely transmitted; whereas, if the direction of the vibration in the incident waves is at right angles to the fixed direction in the second plate, no light can be transmitted; and for positions where these two important lines make an acute angle with each other, a component of the energy of the waves passes through. The waves after passing the first plate of tourmaline are said to be 'plane polarized,' meaning that all the vibrations in the waves are now in parallel straight lines. A test for plane polarized waves, further, is to see if they can pass through a thin plate of tourmaline with maximum intensity for two positions of the plate, and be cut off completely for two positions at right angles to the other two.

In this way it may be shown that each of the beams of light transmitted by a doubly refracting substance is plane polarized, but that the position of the tourmaline plate required to produce extinction of one beam is perpendicular to that required to extinguish the other: the two beams are said to be 'polarized in planes at right angles' to each other. (In fact tourmaline is itself a uniaxial double refracting substance; but unless it is made in a very thin plate, only one kind of ray is transmitted, the 'extraordinary'—the 'ordinary' rays are absorbed in the crystal.) Similarly, if ordinary light falls upon a plane face of any isotropic transparent substance, e.g. glass or water, both the reflected and the transmitted waves are found to contain some that are plane polarized—but in planes that are at right angles to each other for the two cases; and for a definite angle of incidence for each such substance all the reflected light will be plane polarized. (Different kinds of plane polarized light are distinguished by saying that they are 'polarized in different planes.' By definition the 'plane of polarization' of light polarized by reflection is taken as the plane which includes the incident and reflected rays.)

This angle of incidence is called the 'polarizing angle' for the transparent substance. (The tangent of the polarizing angle equals the index of refraction. This is known as *Brewster's law.*) The refracted light in this case is a mixture of ordinary light and plane polarized light.

The two methods most in use for producing plane polarized light are to allow ordinary light to be reflected from glass at the polarizing angle, and to allow ordinary light to pass through a 'Nicol's prism.' This consists of two pieces of a crystal of Iceland spar cut in a definite manner and cemented together by Canada balsam; Iceland spar is a uniaxial crystal and so the incident light is broken up into two trains of waves, the ordinary and the extraordinary; when these reach the layer of Canada balsam, the former suffers total reflection, while the latter is transmitted; thus the emerging light is plane polarized. It is found, too, that the light scattered by fine particles, e.g. the blue light of the sky, is plane polarized.

It is possible by several methods so to alter plane polarized light that all the vibrations in the ether as the waves pass are in circles or in ellipses; such light is called 'circularly' or 'elliptically' polarized. Ordinary light such as comes from the sun or a lamp can be considered as a mixture of all kinds of polarized light, plane, circular, and elliptical. (If plane polarized light is reflected from a metallic surface it becomes elliptically polarized.)

If ordinary light is incident upon a thin plate of any doubly refracting substance, it may be shown that two beams of plane polarized light—with their vibrations at right angles to each other—will be transmitted; and further, these beams will travel through the plate at different speeds, so that on emerging one will be slightly in advance of the other so far as the phase of the waves is concerned. If these two beams now enter a Nicol's prism, only a component of each will be transmitted, for the prism allows to pass vibrations in a definite direction only, which direction is not in general that of the vibration in either of the two beams. If the light which falls upon the thin plate is itself plane polarized, it will be broken up as before into two beams, and they will be recombined into a plane polarized beam by the Nicol's prism. The two component beams are in different phases; and, if one is retarded by an amount equal to half a wave-length for any color or any odd number of half wave-lengths, then, when these beams are combined by the Nicol so as to have their vibrations all in one direction, the waves of this particular color will be absent, owing to interference, if the intensities of the two coinciding beams are the same, and if the incident light is white the emerging light will be colored. (If the incident light had not been plane polarized, there would not have been a definite relation between the intensities of the beams coinciding in the Nicol's prism.) This experiment offers a most delicate test of the double refraction of any substance: place two Nicol's prisms in line, and turn one around its axis until no light is transmitted through the two—they are said to be 'crossed;' now introduce between them the substance to be investigated. If it is doubly refracting, light will now be transmitted through the Nicol's prisms. This is sometimes called 'depolarization.'

For a full description of the other properties of polarized light, some large treatise should be consulted.

ETHER AND MATTER.

Among the phenomena of light which can be explained only by assuming some definite connection between the ether and matter, are dispersion, both regular and anomalous; absorption and emission; color; fluorescence and phosphorescence; rotation of the plane of polarization by quartz and other bodies; metallic reflection; the various magnetic actions on light, etc.

DISPERSION. As has been already explained, dispersion is due to the fact that ether-waves of different wave-length have different indices of refraction for any one material substance; that is, they have different velocities in it. As a rule the velocity decreases, i.e. the index of refraction increases as the wave-length decreases. This is called regular dispersion. There are, however, many substances for which this is not true; for instance, in fuchsine the indices of refraction of the red and yellow waves are greater than those for the blue and violet. If a spectrum of white light is formed on a screen by means of a slit, a prism of glass, and a lens, the colors will be arranged in the order red, yellow, green, blue, violet—the red being deviated least, i.e. having the least index of refraction. If, however, a prism of fuchsine is used in place of the glass one, the order of colors will be blue, violet, red, yellow—the green being absent. Fuchsine is a substance having a green 'surface-color' (see COLOR), and so this color is absent in the transmitted light. The resulting spectrum produced by a fuchsine prism is then exactly as if the ordinary spectrum had been cut in two by the removal of the green and the two halves displaced over each other. In other words, with bodies possessing surface color of a definite wave-length, the indices of refraction of the waves on the two sides of the absorbed waves are changed; if their indices are less than that of the absorbed color for ordinary media, they are increased, and vice versa. This is known as 'anomalous dispersion.'

ABSORPTION. When white light falls upon any material substance there is always a certain amount scattered from the surface, and also as a rule some scattered from the interior portions of the body if light enters. The light scattered from the surface is white, but if the body is a piece of polished metal or has a 'metallic lustre,' there is mixed with the white light some that is colored. This colored light is due to the fact that there is a certain amount of absorption of waves of a particular wave-length at the *surface*. Thus gold appears yellow, because out of the incident white light the bluish-green light enters at the surface, and the yellow light is reflected. If a sheet of gold is hammered out extremely thin, the transmitted light is bluish. If the light penetrates into a substance, and is either transmitted through or reflected out by small solid particles serving as mirrors, the color is generally the same, being due to the absorption of certain waves in the body of the substance. (The energy of these absorbed waves goes generally into heat-effects, but may be spent in producing fluorescence, q.v.) Some substances absorb two or more colors to different extents; so a thin plate of it will be of a different color from a thick one.

As explained in the article on COLOR, the particular color ordinarily attributed to a substance is that perceived by a normal eye when viewing the substance in white light. There are two methods for determining the cause of the color of an object. One method is to put it, if it is not opaque, between the slit and prism of a spectroscope, the slit being illuminated by white light, and to notice the change in the spectrum. The resulting spectrum is called the 'absorption spectrum' of the body, and the colors which are transmitted are the ones which, when combined in the eye, produce the color of the object. The other method is to throw a pure spectrum of white light on a screen, and to move the object slowly along through the spectrum; if it appears black when held in any color, it shows that the waves of this color are absorbed by the object. If two pieces of colored glass are superimposed, or if two colored paints are mixed, the resulting color is that due to the waves which are left after each glass or each paint has subtracted its colors.

Absorption must be due to the fact that the 'atoms' of matter can vibrate in definite periods; and if ether-waves of a proper period enter the substance they will by resonance set the portions of matter in vibration and so lose their own energy. If the energy thus gained by the atoms is dissipated among the molecules, increasing their energy, heat-effects are produced. It may happen, however, that atoms are set vibrating in definite periods by the absorption of ether-waves of shorter period, and, instead of having their energy spent in heat-effects, emit ether-waves of their own. This is called 'fluorescence' (q.v.). Thus a solution of quinine absorbs ether-waves whose period is so short that they are invisible, and in return for them emits violet and blue light. If the fluorescent body continues to emit light for some time after the incident light is cut off, it is said to be 'phosphorescent.'

RADIATION. As explained in the article RADIATION, all material bodies are emitting ether-waves; that is, by reason of the vibrations of the atoms, disturbances are produced in the ether. The nature of these waves emitted by any body may be determined by analyzing the radiation, using a suitable dispersing apparatus —prism or grating or interferometer—and studying the resulting spectrums. The difficulty comes in obtaining instruments which detect the presence of ether-waves of all lengths. These waves carry energy; and if an instrument absorbs them, some change in it will be produced, provided it is sensitive enough, the kind of change depending on the nature of the instrument and the wave-length of the waves. Thus, if waves of wave-length extending from about 0.000015 cm. to 0.00007 cm. fall upon suitable photographic plates, there is chemical action produced; if waves of wave-length between about 0.000039 cm. and 0.000075 cm. enter the human eye, color is perceived; if waves of wave-lengths from 0.00004 cm. to 0.007 cm. are absorbed by suitable thermometers (q.v.), change in temperature is noticed. Waves longer than 0.007 cm. have not yet been observed as being emitted by ordinary matter; waves longer than 0.2 cm. may, however, be produced by electrical means. Using proper instruments, it has been proved that solids and liquids emit continuous spectra; that is, waves of all wave-lengths between certain limits can be shown to be present. Gases, however, when rendered luminous by the passage of an electric discharge through them or when produced by vaporizing solids in the electric arc, give discontinuous spectra; that is, only isolated trains of waves are present. This is what would be expected.

In a gas the molecules have great freedom of motion, and as one dashes to and fro having successive encounters with other molecules, its atoms have time during the intervals of free motion to emit long trains of waves of definite periods. But the molecules of solids and liquids are so close together and so hamper each other that there is no opportunity for the atoms to vibrate freely. Since the 'emission spectrum' of a gas is due to the natural frequencies of the atoms, and since the 'absorption spectrum' of any body when light of a continuous spectrum falls upon it is due to the absorption of the energy of those incident waves whose frequencies are the same as those of the atoms, it might be expected that those waves present in the former are absent in the latter. This is observed to be true, with certain limitations. See Radiation and Spectroscopy.

Rotation of the Plane of Polarization by Quartz, etc. A most important connection between matter and the ether is shown by the fact that when plane polarized light is passed through certain bodies—called 'optically active' substances—the emerging light is plane polarized, but the plane polarization, i.e. the direction of the vibration, has been rotated. If a Nicol's prism is so placed as to extinguish the plane polarized homogeneous light before the optically active substance is introduced in the path of the light, it will be necessary to turn the Nicol around its axis through a certain angle in order again to extinguish the light after the substance is introduced between the source of light and the Nicol. In some cases the Nicol must be given a right-handed rotation, and in other cases a left-handed one. If the direction of the light is reversed in the body, so is the rotation. Bodies which necessitate the former are called 'dextro-rotatory', and those which require the latter, 'lævo-rotatory.' The amount of rotation of the plane of polarization is different for different substances; it is different for waves of different color, being greater for shorter waves; it varies directly as the thickness of the layer of the substance. In some specimens of quartz the rotation is right-handed; in others, left; and it is found that these two kinds of quartz have a similar difference in their crystalline structure. Turpentine is optically active; so are solutions of certain sugars, two forms of tartaric acid, and all organic compounds involving an 'asymmetrical carbon atom.'

Electro-Magnetic Phenomena. The connection between light and electro-magnetic phenomena is shown in several ways: the identity in the properties of 'light-waves' and the waves produced by electric oscillations; the rotation of the plane of polarization in a magnetic field; the Kerr phenomenon; the Zeeman effect, etc.

It is shown in the article on Electricity that the waves produced by electric oscillations are transverse waves in the ether, and that they have the same velocity as 'light-waves.' They can be polarized, can be made to interfere, can be reflected, refracted, etc. The shortest wave-length so far observed, for waves produced by electrical oscillations, is about two millimeters. It can be shown also that the velocity of ether-waves in any transparent medium should vary as the square root of the reciprocal of the product of the electric and magnetic inductivities of that medium. The values of these quantities (K and μ) for the pure ether can be written K_0 and μ_0; therefore the index of refraction of the transparent medium is $n = \sqrt{\frac{K\mu}{K_0\mu_0}}$. For all such media $\mu = \mu_0$; and $K_0 = 1$ on the C. G. S. electrostatic system; so $n = \sqrt{K}$, where K is the value of the electric inductivity (or dielectric constant) of the transparent medium. This n is the index of refraction for *very long waves*, because K is always measured by methods which involve slow oscillations. This formula is verified by experiment in many cases.

As noted also in the article on Electricity, when a beam of plane polarized light is made to pass along the axis of a powerful electromagnet, the plane of polarization is rotated in the direction in which the current in the magnetizing helix is flowing. This is called the Faraday effect. So, if the direction of the beam of light is reversed, the rotation is not. The amount of the rotation varies greatly with the transparent matter which occupies the magnetic field; it is proportional to the strength of the magnetic field; it varies with the wave-length and with the temperature.

It was stated in speaking of polarized light that if plane polarized light is incident upon a plate of polished metal, the reflected light is elliptically polarized. Kerr discovered that, if the metal surface is one end of a magnetized bar of iron, the reflected light is not the same as from a surface of unmagnetized iron. He found further that the changes were opposite in kind if the reflection took place from first a north pole and then a south one. Changes are also observed when the light is transmitted through thin films of magnetized iron.

Zeeman Effect. A most important discovery, made by Zeeman, has led to a series of interesting observations. He has shown that the light emitted by a flame when placed in a magnetic field is different from that emitted ordinarily, and further that there are differences depending upon whether the flame is viewed along the field of magnetic force or at right angles to it. These observations seem to prove that the ether-waves emitted by the flame are actually produced by the vibrations of minute portions of matter electrically charged, which have been called 'electrons.' (In this connection reference should be made to the *Reports of the International Congress of Physics*, Paris, 1900, vol. iii.)

Bibliography. Preston, *Theory of Light* (London and New York, 1895), is to be recommended as an accurate and interesting treatise on optical theory for the student possessing some knowledge of mathematics. Other works to be recommended are: Drude, *Lehrbuch der Optik* (Leipzig, 1900, English trans. by Mann and Millikan, New York, 1902); Crew, *Wave Theory of Light* (New York, 1900). In the chapters on Optics in Müller-Pouillet, *Lehrbuch der Physik*, vol. ii. (9th ed., Brunswick, 1897), and Wüllner, *Lehrbuch der Experimentalphysik*, vol. iii. (5th ed., Leipzig, 1900), will be found complete descriptions and explanations of optical phenomena.

LIGHT, Aberration of. See Aberration of Light.

LIGHT, Easement of. The right to the free access of light to one's windows from and over the land of another. The right to light arises only by grant or by a prescriptive use and enjoyment for a long period of time. When acquired in the latter way it is in England known as the easement of *ancient lights* (q.v.). In the United States it can in general be acquired only by grant, it being regarded as incompatible with the conditions which commonly prevail in this country to permit its acquisition by mere uses and lapse of time. The easement of lights belongs to the class of so-called negative easements, as it involves no trespass or encroachment on a neighbor's land, but has the purely negative operation of preventing him from so using his land as to interfere materially with the light enjoyed by the premises to which the right attaches. The easement once created continues so long as the house stands to which it is appurtenant or until the latter is so altered as to show an abandonment of the right by the owner thereof. It should be noticed that one may always open windows overlooking another's premises without thereby infringing the latter's property rights, but that, in the absence of an easement of light, such windows may be darkened by the owner of such premises at his pleasure. See EASEMENT, and authorities there cited.

LIGHT, STANDARDS OF. See PHOTOMETRY.

LIGHTER (from *light*, AS. *lēoht*, Goth. *leihts*, OHG. *lihti*, *līht*, Ger. *leicht*, light, not heavy; probably connected with Lat. *levis*, Lith. *lengwùs*, Gk. *ἐλαχύς*, *elachys*, Skt. *laghu*, *raghu*, light). A strong, heavy, flat-bottomed boat of large size used for transporting cargo or heavy weights to and from ships. It is usually open, but the larger lighters have a deck and very large hatches with light, removable covers. In large harbors the lighters usually have a mast and a single sail set on a gaff, but without a boom. In small harbors, oars or sweeps are the customary motive power.

LIGHT'FOOT, JOHN (1602-75). One of the earlier Hebrew scholars of England. He was born at Stoke-upon-Trent, in Staffordshire, March 29, 1602. He studied at Christ's College, Cambridge, and after entering into orders, became chaplain to Sir Rowland Cotton in London, who, being himself a good Hebrew scholar, inspired Lightfoot with a desire to become one also. In 1629 appeared his *Erubhim, or Miscellanies, Christian and Judaical*, dedicated to Cotton, who in 1630 presented him to the rectory of Ashley in Staffordshire. In 1642 he removed to London that he might have better opportunities for the prosecution of his favorite study; and in 1643 he was chosen rector of Saint Bartholomew's, near the Exchange, to the parishioners of which he dedicated his *Handful of Gleanings out of the Book of Exodus* (1643). His most important work is *Horæ Hebraicæ et Talmudicæ*, etc. (1658-74), reëdited in English by Gandell (4 vols., Oxford, 1859). It is a commentary on parts of the New Testament from rabbinical sources. Lightfoot was one of the assembly of divines who met at Westminster in 1643, and, in the debates that took place there, betrayed predilection for the Presbyterian form of Church government. In 1644 he became rector of Great Munden, Hertfordshire, and so remained the rest of his life. In 1650 he was appointed master of Saint Catharine Hall, Cambridge, and in 1654 vice-chancellor of the university. At the Restoration he was confirmed in his rectory and mastership, and in 1662 he complied with the terms act of the university. He was made a prebendary of Ely in 1668 and died there, December 6, 1675. His works in English, original or translated, first appeared in a collected edition, 2 vols., at London, 1684; the best edition is by J. R. Pitman, with biography and bibliography (13 vols., London, 1822-25).

LIGHTFOOT, JOSEPH BARBER (1828-89). An English prelate and theologian. He was born in Liverpool and educated under James Prince Lee at King Edward's School, Birmingham, where his most intimate friend was E. W. Benson, the future Archbishop. Thence he went to Cambridge, where he was elected a scholar of Trinity in 1849 and a fellow in 1851. He was ordained deacon in 1854 and priest in 1858 by his old schoolmaster, then Bishop of Manchester. He spent thirty years at Cambridge, taking a prominent place in all educational matters; he succeeded Ellicott in 1861 as Hulsean professor of divinity, and Selwyn in 1870 as Lady Margaret professor. The duties of a canonry at Saint Paul's Cathedral (from 1871) and of a hard-working member of the company of New Testament revisers (1870-80) filled up all the time he could spare from Cambridge work. He had declined the Bishopric of Lichfield in 1867, but accepted that of Durham in 1879. One of his first steps was to move for a division of the immense diocese by the creation of the See of Newcastle; and he labored indefatigably until his death in 1889 to promote every form of spiritual activity. He left a number of important theological works, especially the great edition of the Apostolic Fathers (*Clement of Rome*, 1869, 2d ed. 1890, on which he was working only three days before his death; *Ignatius and Polycarp*, 1885, 2d ed. 1889), and commentaries with revised text on the *Epistles to the Galatians* (1865), *Philippians* (1868), *Colossians and Philemon* (1875), all of which have gone through numerous editions.

LIGHT'HALL, WILLIAM DOUW (1857—). A Canadian author. He was born in Hamilton, Ontario, and graduated at McGill University in 1879. He subsequently studied law and was admitted to the bar in 1881. He devoted much of his time to literature; was made an honorary member of the Scottish Society of Literature and Art and a fellow of the Royal Society of Literature of Great Britain. His publications include: *Thoughts, Moods, and Ideals* (1887); *The Young Seigneur* (1888); *The False Repentigny* (1889); *An Account of the Battle of Châteaugay* (1889); and *Montreal After 250 Years* (1892).

LIGHTHORSE HARRY. A name given to the American general Henry Lee, on account of his cavalry operations during the Revolutionary War.

LIGHTHOUSE. A building on some conspicuous point of the seashore, an island or rock, from which light is exhibited at night as a guide to mariners. The importance of such structures has been understood since very remote times, and the ancients devoted considerable attention to lighthouse construction, but it is only within the last hundred years that these aids to the mariner have been developed upon systematic and scientific lines. At present all maritime nations have governmental bureaus or departments whose sole duty it is to establish and maintain lighthouses. In France this body is known as the *Commission des Phares*, and its membership comprises four engineers, two naval officers, one member of the Institute, one inspector-general, and one hydrographic engineer. In England the Corporation of Trinity House has charge of the English lights; the Scottish lights are under the management of the Commissioners of Northern Lights, and the Irish lights are under the care of the Corporation for Preserving and Improving the Port of Dublin, which is commonly called the Ballist Board. The fund with which these boards carry on their work is provided by the one-half penny per ton due charged every vessel at each time it passes the lighthouse. In the United States the construction and maintenance of lighthouses is in charge of the Lighthouse Board (q.v.).

ANCIENT LIGHTHOUSES. The oldest lighthouses known were the towers built by the Lybians and by the Cushites of Lower Egypt. The light consisted of burning fuel in a brazier hung from a pole projecting from the tower toward the sea. The Romans built many fine light towers in Italy, but comparatively little is known about their construction and dimensions. Perhaps the most famous tower of antiquity was that erected on the island of Pharos near Alexandria about B.C. 285. The Romans built light-towers at Dover and Boulogne on the English Channel. Little is known of the Dover tower, but the Boulogne tower was a masonry structure octagonal in plan, 192 feet in circumference and 200 feet high. It was built in twelve stories, each three feet less in diameter than the one beneath it. The rock on which this lighthouse was situated was undermined by the waves and fell, with the lighthouse, between 1640 and 1645, after the light had guided mariners for probably 1450 years. Towers of later mediæval times which are deserving of mention are the Torre del Capo, near Genoa, first built in 1139, removed in 1512 and rebuilt in 1643; the Pharos of Metoria, built by the Pisans in 1154 and several times destroyed and rebuilt; and the Tower of Cordouan, situated at the mouth of the Gironde and finished in 1610. These are only a few examples of ancient lighthouses, but they indicate quite well the general character of these early works; viz., towers of masonry on the tops of which were built fires to serve as lights.

MODERN LIGHTHOUSES. Modern lighthouses may reasonably be said to date from the construction of the *Eddystone lighthouse* by John Smeaton in 1756-1759. The Eddystone rocks are a particularly dangerous reef lying in the English Channel about 14 miles from Plymouth, England. Smeaton's Eddystone lighthouse was a circular masonry tower broad at the base and narrowing by a curve to a slender waist at the base of the lantern-housing. The masonry of the tower was a very intricate piece of dimension stone masonry, the stones being dovetailed together in such a way as to make each course practically a single stone. The height of the masonry structure to the focal plane of the lantern was 72 feet. In 1877 work was begun on a new Eddystone lighthouse to replace Smeaton's, which was not high enough to keep the waves from dashing over the lantern, and which, moreover, had become endangered by the undermining of the natural rock. In the new structure the tower was made cylindrical to a height of two and one-half feet above the highest tides and diminishing in size above this level. It was made 132 feet high from high-water level to the focal plane of the lantern, the masonry being of dimension stones cut so as to interlock and further held together by bronze bolts. The new lighthouse was completed in 1882.

Faulty as Smeaton's design was in certain respects, it served as a model for lighthouse construction in masonry which has been followed in its general features ever since.

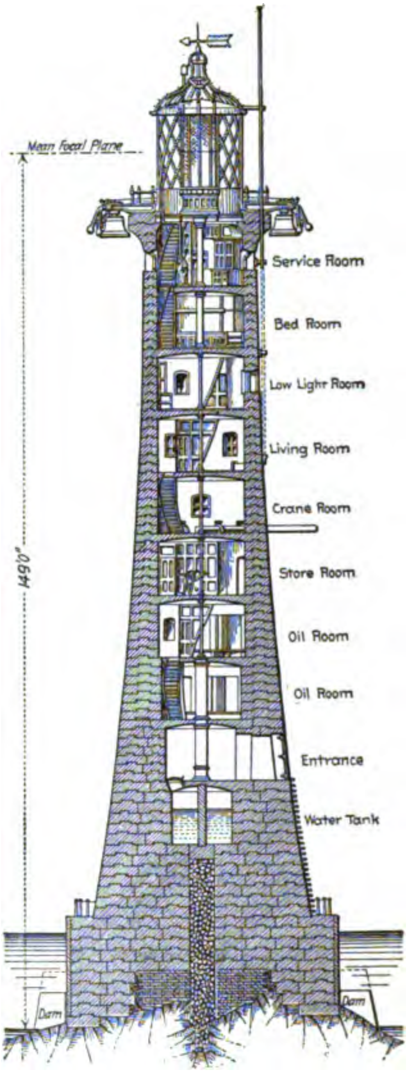


FIG. 1. VERTICAL SECTION SHOWING INTERIOR OF NEW EDDYSTONE LIGHTHOUSE.

The Bell Rock lighthouse, off the east coast of Scotland, is built upon a reef of rocks in the German Ocean, 11 miles from the coast, nearly opposite the Firth of Tay. The rock upon which it stands is red sandstone from 12 feet to 15 feet below spring tide, with from 2 feet to 4 feet exposure at low tide. The tower is also of sandstone, but the facing masonry for a height of 30 feet is granite. It was designed by the celebrated engineers Robert Stevenson and John Rennie, and was modeled after the Eddystone lighthouse of Smeaton. Its diameter at the base is 42 feet and at the top beneath the cornice it is 15 feet. The stonework is 102½ feet high and the top of the lantern is 115 feet high. Work was begun in 1807 and finished in 1810. The Skerryvore lighthouse, off the west coast of Scotland, is built upon a cluster of rocks, the largest of which, known as Skerryvore rock, carries the lighthouse. The engineer was Allan Stevenson, who adopted a design for the tower resembling more nearly the frustum of a cone than did the Eddystone and Bell Rock towers. The tower is circular, 42 feet in diameter at the base, 16 feet in diameter at the top, and 138 feet high to the base of the lantern. Work was begun in 1838 and finished in 1842. Wolf Rock lighthouse, situated on Wolf Rock between Scilly and Lizard Point, off the English coast, has a tower in the form of a concave elliptical frustum 116½ feet high, 41⅔ feet in diameter at the top. It was begun in 1862 and finished in 1869.

The Héaux de Brehat lighthouse is situated on the rock of the same name about three miles from the most northerly point of the peninsula of Brittany. It consists of a tower with an interior cylindrical opening 14 feet in diameter, 158 feet high from its base to the lantern floor. The tower consists of two parts, the lower part being a concave frustum and the upper part being nearly a true cylinder. The lighthouse of Ar-men, which is situated on one of a series of rocks off Cape Finisterre, France, is another masonry lighthouse of French design which is notable for its exposed situation and the consequent difficulties of construction. The height of the focal plane of the light is 96 feet above sea-level. The lighthouse of Triagoz, in the Department of Nord, is another French example of exposed sea-rock lighthouse construction. The masonry tower is square and 92 feet high, with the focal plane of the light 6 feet above this height.

In America, masonry lighthouse towers of notable character have been built at Minot's Ledge, Spectacle Reef, and Tillamook Rock. Minot's Ledge, off the town of Cohasset, in Massachusetts Bay, about 20 miles east-southeast of Boston, is one of the most dangerous places in the world without a signal. The difficulties in the construction of a lighthouse upon this rock were immense. The first structure, which was of iron, was completed in 1849, but stood only until April, 1851, when it was demolished by a terrific storm. In 1852 money was appropriated by Congress for a new lighthouse, and work was commenced in 1855, but it was not till the latter part of 1857 that the first stone was laid. The structure was completed in 1860. It is a granite tower in the form of a frustum of a cone, having a base 30 feet in diameter, and a height of stonework of 88 feet, the lower 40 feet being solid. The courses are dovetailed, and are fastened with wrought-iron dowels.

The lighthouse at Spectacle Reef, in the northern part of Lake Huron, was built not only to resist waves, but ice-fields, often covering thousands of acres and moving at the rate of two or three miles per hour. That the structure should be able to withstand this force, it was so designed as to cause the ice to be broken and piled into a protecting barrier. The tower is the frustum of a cone, 32 feet in diameter at the base, and 18 feet just beneath the cornice at a height of 80 feet. The whole height of the stonework is 93 feet above the base, which is 11 feet below the surface of the water. The tower is solid as high as 34 feet, above which it contains five stories, each 14 feet in diameter. The work was commenced May 1, 1870, and the light was first used June 1, 1874. The cost was $375,000. Tillamook Rock is a bold isolated basaltic rock in the Pacific Ocean about a mile off Tillamook Head and 20 miles south of the Columbia River. The lighthouse on it, built in 1880-81, consists of a square masonry tower of no great height rising out of the centre of a masonry house 45 × 48 feet in plan, the tower proper being 16 feet square.

The lighthouses so far described were built upon solid rock, and the foundation problem was a simple one except for the work of combating the wind and waves. Another class of lighthouses of even more difficult construction comprises those structures which are located on shoals at long distances from the shore. Here the sinking of the foundations is a serious problem by itself, even were it not complicated by the dangers of wind and water. Perhaps the two most noted masonry towers erected on such foundations are the Rothersand lighthouse, in the North Sea, Holland, and the Fourteen-Foot Bank lighthouse, in Delaware Bay, United States. To build the foundation for the Rothersand lighthouse a caisson, in plan resembling a section of a bi-convex lens and built of boiler iron, was used. This caisson was 36 feet 8 inches wide, 46 feet 8 inches long, and 61 feet 8 inches high. At a height of 8 feet 4 inches above the bottom edge of this lenticular shell there was a transverse diaphragm forming the top of the working chamber. Above this diaphragm the caisson was divided into four stories, the lowest for mixing concrete, the second for the machinery installation, the third for sleeping and store rooms, and the fourth for the revolving steam cranes. The three upper floors were suspended from the caisson by screws so that they could be raised as the work progressed. The caisson was built on the shore, towed to its site, and sunk by the pneumatic process to a depth of 73 feet below low water. After being sunk the caisson was surrounded by a brush mattress three feet thick for a distance of 50 feet on all sides, to prevent the currents from scouring away the sand. The tower and lantern were then erected and work was completed in 1885.

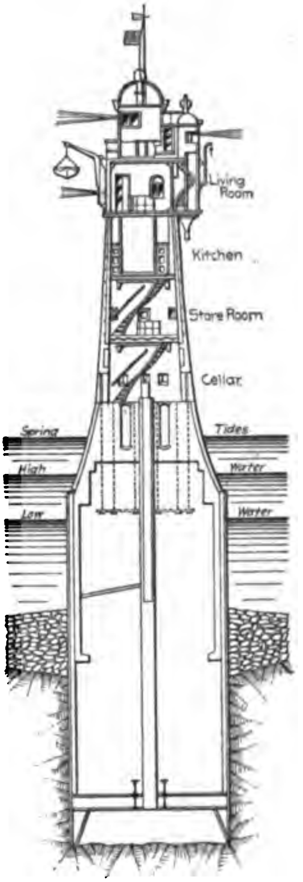


FIG. 2. VERTICAL SECTION SHOWING ROTHERSAND LIGHTHOUSE.

The Fourteen-Foot Bank lighthouse was constructed by means of a pneumatic caisson as was the Rothersand tower. The caisson proper was made of wood, square in plan, and surmounted by a cylindrical cast-iron shell 35 feet in diameter, which, filled with concrete, formed the light-tower. The structure was completed in 1887. Cast-iron, concrete filled, cylindrical lighthouse towers have been constructed in several locations upon rock foundations. The first cast-iron lighthouse ever erected was at Point Morant, Jamaica, in 1842. The tower was built of nine tiers of plates three-quarters of an inch thick and 10 feet high, held together by bolts and flanges on the inside, and then filled in with masonry and concrete to the height of 27 feet. It rests upon a foundation of granite and rises to a height of 96 feet. It is 18½ feet in diameter at the base and 11 feet at the top.

A modern form of lighthouse is constructed on what is called the 'screw-pile' system, an invention of Alexander Mitchell, who, with his son, laid the foundation of the lighthouse on Maplin Sand, at the mouth of the Thames, England. Two similar structures followed, Chapman Head in 1849 and Gunfleet in 1850, also near the mouth of the Thames. Other screw-pile lights were afterwards erected in different parts of Great Britain. The great feature of the screw-pile is that the piles upon which the structure rests are in the form of screws and are driven in the sand or soil to a sufficient depth in the manner of a corkscrew. The first screw-pile lighthouse erected in the United States was by Col. Hartman Bach, United States Engineer Corps, at the mouth of Delaware Bay, eight miles from the ocean, in 1847-50. The screw-pile lighthouse at Sand Key, Florida Reefs, is supported on 16 piles, with an auxiliary pile in the centre to support the staircase, making in all 17. They are eight inches in diameter with a screw of two feet in diameter at the lower ends, which are bored 12 feet into the reef. The framework of the tower consists of cast-iron tubular columns framed together, having wrought-iron ties at each joint, and braced diagonally on the faces of each tier. The keeper's house is supported by cast-iron girders and joists 20 feet above the foundation. The structure is 120 feet above the level of the water. The foundation is 50 feet in diameter.

UNITED STATES LIGHTHOUSE SYSTEM. The theory of coast lighting is that each coast shall be so set with towers that the rays from their lights shall meet and pass each other, so that a vessel on the coast shall never be out of sight of a light. The United States is proceeding upon this theory and lights are being installed upon this plan. The cost of the lighthouse establishment for the first century of its existence in the United States was $93,250,000. The first lighthouse on this continent was built at the entrance to Boston Harbor and was supported by light-dues of 1*d.* per ton on all incoming and outgoing vessels except coasters. When the United States, in 1789, accepted the cession of the title to and jurisdiction over the lighthouses on the coast, and agreed to maintain them thereafter, they were eight in number, and were placed in the care of the Treasury Department. Up to 1820 the number of lights increased from 8 to 55, and each seems to have been built to meet immediate want without regard to any general system. Under the Fifth Auditor of the Treasury, Stephen Pleasanton, who was popularly known as general superintendent of lights from 1820 to 1852, the number of lighthouses increased from 55 to 325, and numerous buoys and other aids to navigation were erected. In 1852 Congress passed an act constituting the Lighthouse Board as it now exists. The board, finding from the experience of the keepers of the lights at Highlands of Navesink that the lenticular apparatus could be managed by the average light-keeper after instruction by an expert, and that its use was more economical in oil than was the reflector apparatus in use, pushed its substitution with vigor, and, as they had anticipated, with a diminution of the annual expenditure for oil.

The construction of lighthouses in the United States varies greatly. Those built on the New England coast previous to 1840 were either of rubble masonry, in the shape of conical towers, or wooden frame towers built on the roofs of the keepers' dwellings. The stone towers were generally three feet thick at the base, tapering to two feet in thickness at the top, and from 20 to 50 feet in height. The iron-pile structure was introduced next, and great improvement followed in the combination of the framework, in the arrangement of elevated apartments for keepers, and in making disk pile and other improved foundations. There are a large number of screw-pile lighthouses, chiefly in Southern waters, and where dry foundations are found, iron plates have been used to form the structures in later years. A number of brick towers and iron skeleton towers are also in use. The lights in the various lighthouses are classed in six groups or orders, depending upon their size. The first-order lights, which are the largest, have a lenticular apparatus which stands nearly 12 feet in height, and is 6 feet in diameter. Such a light costs from $4250 to $8400. The lights of the second order are 4 feet 7 inches in diameter; those of the third, 3 feet 3⅜ inches; those of the fourth, 19⅝ inches; those of the fifth, 14½ inches; and those of the sixth or smallest order are 11¾ inches. The total number of lights in the United States in 1900, including coast, lake and river lights, lightships, and lighted buoys, was 3163. (See table at end of article.) The river lights, of which there are about twice as many as the others, are considered as separate and distinct from the lighthouses, and are maintained from a separate fund.

LIGHTHOUSE ILLUMINATION. In the *catoptric* or *reflecting system* all of those rays proceeding from the focus of a parabolic mirror which fall upon its surface are reflected parallel to the axis so as to form a solid beam of light. When a series of such reflectors are arranged close to each other round a cylinder in a lighthouse, they illuminate constantly, though not with equal intensity, the whole horizon. As the property of the parabolic reflector is to collect the rays incident upon its surface into one beam of parallel rays, it would be absolutely impossible, were the flame from which the rays proceeded a mathematical point, to produce a light which would illuminate the whole of the horizon, unless there were an infinite number of reflectors. (See PARABOLA.) But as the radiant, instead of being a mathematical point, is a physical object, consisting of a flame of very notable size, the rays which come from the outer portion of the luminous cone proceed, after reflection, in such divergent directions as to render it practically possible to light up, though unequally, the whole

›n. The useful divergence produced in this
›y a burner of one inch in diameter, with a
distance of four inches, is in the horizontal
about 14° 22′. The whole horizon may
be illuminated by reflectors. If, for the
›se of distinction, it is desired to show a
ving light, then several of those reflectors
laced with their axes parallel to each other
ch of the faces of a four-sided frame, which
de to revolve. In such a case, the mariner
light only at those times when one of the
of the frame is directed toward him, but at
times he is left in darkness. The rotation
e frame upon its axis thus produces to his
succession of light and dark intervals,
enables him to distinguish it from the
light which is constantly in view in every
th. The distinction of a red light is pro-
by using a chimney of red instead of white
for each burner.

flashing or scintillating light, giving, by
revolutions of the flame, flashes once every
econds, which is one of the most striking
l the distinctions, was first introduced by
t Stevenson, the well-known lighthouse en-
r, in 1822, at Rhinns of Islay, in Argyle-
The same engineer also introduced what
been called the *intermittent* light, by
a stationary frame with reflectors is in-
aneously eclipsed, and is again as suddenly
led to view by the vertical movement of
e cylinders in front of the reflectors. The
mittent is distinguished from the revolving
which also appears and disappears succes-
to the view, by the suddenness of the
es and of the reappearances, whereas in all
ving lights there is a gradual waxing and
g of the light. Wilson introduced at Troon
or an intermittent light which was produced
beautifully simple contrivance for suddenly
ing and raising a gas-flame. Stevenson
sed an intermittent light of *unequal periods*
using unequal sectors of a spherical mirror
volve between the flame and a fixed dioptric
atus (such as that shown in Fig. 3). The
r of the light is increased by the action of
pherical mirror, which also acts as a mask
opposite azimuths.

other method of bending the divergent rays
eding from a lamp into such directions as
be useful to the mariner is that of *refrac-*
known as the *dioptric system*. If a flame
aced in the focus of a lens of the proper
the diverging rays will be bent parallel to
other, so as to form a single solid beam of
Fresnel was the first to propose and to
duce lenticular action into lighthouse illumi-
n, by the adoption of the annular or built
which had been suggested as a burning in-
ent by Buffon and Condorcet. He also, in
nction with Arago and Mathieu, used a
lamp having four concentric wicks. In or-
o produce a revolving light on the lenticular
optric system, a different arrangement was
ted from that already described for the
tric system. The large lamp was now made
ture, and four or more annular lenses were
together, so as to form a frame of glass
surrounded the lamp. When this frame is
to revolve around the lamp, the mariner
the full effect of the lens whenever its axis
inted toward him and this full light fades
ally into darkness as the axis of the lens passes from him. In order to operate upon those rays of light which passed above the lens, a system of double *optical* agents was employed by Fresnel. These consisted of a pyramid of lenses with mirrors placed above at the proper angle for rendering the rays passing upward parallel to those which came from the annular lens. But Fresnel did not stop here, for, in order to make the lenticular system suitable for fixed as well as revolving lights, he designed a new optical agent, to which the name of *cylindric refractor* was given. This consists of cylindrical lenses, which were the solids that would be generated were the middle vertical profile of an annular lens made to revolve around a vertical axis. The action of this instrument is obviously, while allowing the rays to spread naturally in the horizontal plane, to suffer refraction in the vertical plane. The effect of this instrument is, therefore, to show a light of equal intensity constantly all around the horizon, and thus to form a better and more equal light than that which was formerly produced for fixed lights by parabolic reflection. It is obvious, however, from our description that the diverging rays which were not intercepted by this cylindric hoop, or those which would have passed upward and been uselessly expended in illuminating the clouds, or downward in uselessly illuminating the light-room floor, were lost to the mariner; and in order to render these effective Fresnel ultimately adopted the use of what has been called the internal or total reflection of glass; and here it is necessary to explain that one of the great advantages of internal reflection by glass over metal is the smaller quantity of light that is absorbed. It has been ascertained that there is a gain of nearly one-fourth (.249) by employing glass prisms instead of metallic reflectors for lighthouse illumination. There were introduced above and below the cylindric refracting hoop separate glass prisms of triangular section, the first surface of each of which refracted to a certain extent any ray of light which fell upon it, while the second surface was placed at such an angle as to reflect, by total reflections, the ray which had before been refracted by the first surface; and the last or outer surface produced another refraction, which made the rays finally pass out parallel with those refracted by the central cylindric hoop. The light falling above the cylindric hoop was thus by refractions and reflections bent downward, and that falling below was bent upward, so as to be made horizontal and paralled with that proceeding from the refracting hoop. Fig.

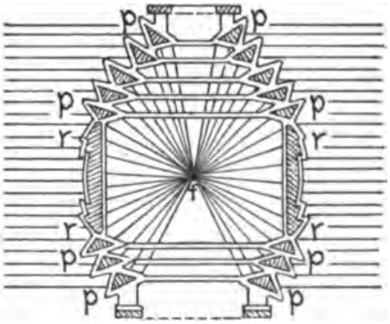


FIG. 3. VERTICAL SECTION OF FRESNEL SYSTEM.

3 represents in vertical section this, which is the most perfect of Fresnel's inventions in lighthouse illumination, especially when made in pieces of the rhomboidal form, and used in connection with a diagonal framing introduced by Allan Stevenson. In Fig. 3 *p* shows the refracting and totally reflecting prisms, *r* the cylindric refractor, and *f* the radiant. From what has been stated, it will be readily seen that, in so far as regards fixed lights, which are required to illuminate *constantly* the whole of the horizon with equal intensity, the dioptric light of Fresnel with Allan Stevenson's improvements is a perfect instrument. But the case is different as regards revolving lights, or those where the whole rays have to be concentrated into one or more beams of parallel rays. To revert to the parabolic reflector, it must be obvious that all rays which escape past the lips of the reflector never reach the eye of the mariner, while, if we return to the dioptric revolving light of Fresnel, we find that those rays which escape past the lens are acted on by *two* agents, both of which cause loss of light by absorption. The loss occasioned by the inclined mirrors, and in passing through the pyramidal inclined lenses, was estimated by Fresnel himself at *one-half* of the whole incident rays. In order to avoid this loss of light, Thomas Stevenson proposed in 1849 to introduce an arrangement by which the use of one of these agents is avoided, and the employment of the total reflection which had been successfully employed by Fresnel for fixed lights was introduced with great advantage for revolving lights. He combined an annular lens, L (Fig. 4); a parabolic conoid, *a*, truncated, at its parameter, or between that and its vertex; and a portion of a spherical mirror, *b*. The lens and mirror were placed at the proper focal distance from the flame, so that all the rays of light coming from the front of the flame were intercepted either by the paraboloid or the lens. The rays emanating from the flame may be regarded as divided into two hemispheres. The lens intercepts part of the anterior hemisphere of rays, and makes them parallel while the remainder fall on the paraboloidal surface, and are reflected parallel. The rays forming the posterior hemisphere falling on the spherical mirror are reflected forward again through the focus in the same lines, but in opposite directions to those in which they came, and then are in part refracted by the lens, and the rest are made parallel by the paraboloid. The result is that rays finally coming from the posterior hemisphere emerge horizontally combined with those from the anterior hemisphere. Thus the entire sphere of diverging rays is collected into one beam of parallel rays without employing any unnecessary agents.

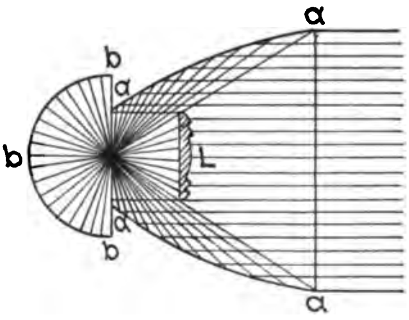


FIG. 4. PLAN OF THOMAS STEVENSON'S SYSTEM.

What has been just described was termed by Stevenson a *catoptric holophote*. What follows is a description of his *dioptric holophote*, in which total reflection is the underlying principle. The front half of the rays is operated upon by totally reflecting glass prisms, similar in section to those applied by Fresnel for fixed lights; but, instead of being curvilinear in the horizontal plane only, they are also curvilinear in the vertical plane, and thus produce, in union with an annular lens, a beam of parallel rays similar to what is produced by the parabolic mirror. The rays proceeding backward fall upon glass prisms, which produce two reflections upon each ray, and cause it to pass back through the flame, so as to fall ultimately in the proper direction upon the dioptric holophote in front, so that the whole of the light proceeding from the flame is thus ultimately parallelized by means of the smallest number and the best kind of optical agents. It is a remarkable property of the spherical mirror that no ray passes *through* it, so that an observer, standing behind the instrument, perceives no light, though there is nothing between him and the flame but a screen of transparent glass. Where the light is produced by great central stationary burners, the apparatus assumes the form of a polygonal frame, consisting of sectors of lenses and holophotal prisms, which revolves round the flame, and each face of which produces a beam of parallel rays. Hence, when the frame revolves round the central flame the mariner is alternately illuminated and left in darkness, according as the axis of each successive face is pointed toward him or from him. In the revolving holophotal light one agent is enabled to do the work of two agents in the revolving light of Fresnel, as total reflection, or that by which least light is lost, is substituted for metallic reflection. The dioptric holophotal system, or that by which total reflection is used as a portion of the revolving apparatus, was first employed on a small scale in 1850 at the Horsburg lighthouse, and on a large scale in 1851 at North Ronaldshay in Orkney. Since that date this system has been all but universally introduced into Europe and America.

AZIMUTHAL CONDENSING LIGHT. The above is a description of the general principles on which lighthouses are illuminated. In placing a light in some situation, regard, however, must be had to the physical peculiarities of the localities. The following plans of Thomas Stevenson may be cited as examples. Where it is only necessary to illuminate a narrow sound, it is obvious that the requirements are very different than where the light is distributed equally all around the horizon. On the side next the shore, no light is required at all; across the sound, a feeble light is all that is necessary, because the distance at which it has to be seen is small, owing to the narrowness of the channel; while up the sound and down the sound the sea to be illuminated is to be of greater or lesser extent, and requires a corresponding intensity. If the light were made sufficiently powerful to answer for the greater distance, it would be much too powerful for the shorter distance across the sound. Such an arrangement would occasion an unnecessary waste of oil, while the light that was cast on the landward side would be altogether useless. Fig. 5 represents (in plan) the condensing light, by which the light proceeding from the flame is allocated in the different azimuths in proportion to the distances at which the light requires to be seen by the mariner in those azimuths. Let us suppose that the rays marked *a* require to be seen at the greatest distance down the sound, and those marked *b* to a somewhat smaller distance up the sound. In order to strengthen those arcs, the spare light proceeding landward, which would otherwise be lost, is intercepted by portions of holophotes, B and C, subtending spherical angles proportioned to the relative ranges and angular spaces of the arcs *a* and *b*. The portions of light thus intercepted are made parallel by the holophotes, and fall upon *straight* prisms *aa* and *bb* respectively, which again refract them in the horizontal plane only; and, after passing through focal points (independent for each prism), they emerge in separate equal beams, and diverge through the same angles as *a b* respectively. In this way, the light proceeding up and down the sound is strengthened in the required ratio by utilizing, in the manner we have described, the light which would otherwise have been lost on the land, and a considerable saving is effected.

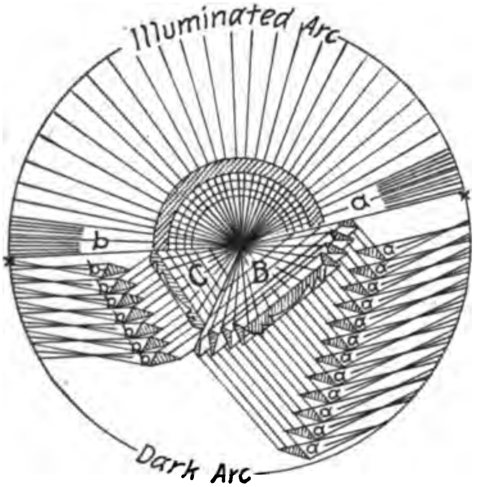


FIG. 5. PLAN OF CONDENSING LIGHT.

LIGHTSHIPS are vessels fitted out with lights moored at sea in the vicinity of reefs. Prior to 1807 the lantern was hung at the yard-arm. Robert Stevenson then introduced a system of lanterns, grouped around a copper tube capable of receiving the vessel's mast, which passed through the tube. In this way proper optical appliances could be employed, and the lantern lowered on the mast so as to pass through the roof of a house on the deck, where the lamps are filled or trimmed. In 1864 six floating lights were constructed for the Hugli under the directions of the Messrs. Stevenson, in which the dioptric principle was applied. Eight half-fixed light apparatus of glass with spherical mirrors behind were placed in the lantern round the mast so as to show in every azimuth rays from three of them at once. In 1900 the United States had 44 lightships in position, each ship showing either one or two lights. Each light is composed of eight reflectors 12 inches in diameter set upon a ring which encircles the mast and can be lighted and hoisted to the masthead at night and lowered and housed by day. Certain of the British lightships show revolving lights, some of which are red. Lightships are employed in those positions where lighthouses are necessary but where they have not been constructed because of the great difficulty of erecting them.

SOURCES OF LIGHT. The descriptions which have already been given have all had reference to the best means of employing a given light. Many attempts have from time to time been made to increase the power of the radiant itself. The illuminant of the lighthouse establishment has been changed frequently. The earliest one used on the North American coast consisted of balls of pitch and oakum burned in open braziers at Point Allerton, in 1673, which was succeeded by tallow candles at Boston Harbor in 1716. Next came fish oil, burned in spider lamps, and afterwards sperm oil, burned in a sort of argand lamp in Winslow's magnifying and reflecting lanterns, which remained in use up to the time of the establishment of the Lighthouse Board. As sperm oil became more and more expensive, the attention of the board was directed to finding cheaper illuminant, and it was found that colza, the oil expressed from the seeds of wild cabbage and several other plants, which was largely used in France and Great Britain, would fulfill all the conditions except that of being of home production. This was overcome by stimulating the cultivation of the plants and the manufacture of the oil from the seeds as a private industry. Further experiments with lard oil were made, with such success as to prove that the latter oil of a certain grade was a more desirable illuminant than colza, as it was more certain in quantity and production and was more economical in price. This became the next established illuminant. The use of petroleum had attracted attention for a long time, and in 1855 the United States Lighthouse Board made some unsuccessful experiments with it. Meantime the price of lard oil had so increased that some other illuminant became a necessity, and as mineral oil in one form or another was in successful use in European lighthouses, the board renewed its experiments with petroleum. The first difficulty was that of the lamp in which it should be burned. This was finally overcome by the board, which succeeded in producing a lamp in its own laboratory that proved satisfactory and that was introduced into the lighthouses. The following qualities were determined by the board in reference to petroleum: It fixed the flashing test of the mineral oil that would be accepted for lighthouse use at 140° F., the fire-test at 154°, and the freezing test, at which it would remain limpid, at zero. Litmus paper immersed in it for five hours must, by remaining unchanged in color, show its freedom from acid; its specific gravity must not be less than .802; and it is to be paid for by weight, at the rate of 6 8-10 pounds net weight to the gallon. The difficulty of storing and transporting such quantities in bulk was conceded, but its danger was evaded by having the oil placed at once in five-gallon cans, where it was to remain until transferred to the lighthouse burners for combustion. Mineral oil is now used throughout the lighthouse establishment. It is claimed that five gallons of mineral oil will give as much light as four gallons of lard oil, while mineral oil at the present writing costs about 8½ cents, and lard oil 57 cents per gallon. The highest price paid for mineral oil since the board commenced to use it in large quantities was 30 cents per gallon; the lowest 6¼ cents. A certain class of lights are shown at the ends of long piers, which are often dangerous to reach in heavy weather, when they are swept by the waves and wind. For this purpose a burner has been invented on the constant-level principle, which will keep a light burning for six and even eight days and nights without attention, so the light need only be visited in safe weather.

Gas. The use of gas has been attempted in a number of places. Accidents to the gas-pipes are most liable to occur in very bad weather, when repairs are most difficult to make. Compressed gas supplied from tanks is in use for lighting buoys (q.v.) and inaccessible beacons. A combination gas-machine is used to furnish the light to some of the stations on the Northwestern lakes. This machine works automatically, making the gas from gasolene and furnishing a light which can burn, according to the size of the machine, from thirty to ninety days without attention.

Electric Light. Experiments with this illuminant have not been exhaustive, and it is by no means certain that electric lighting is generally superior to the present system. In some places the intensity of the electric light has proved a detriment to its use, as was the case with the Hell Gate electric light. This tower, 255 feet high, was the tallest skeleton iron tower erected by the United States lighthouse service. It showed nine electric lights, each of 6000-candle power, and was designed to illuminate the narrow, intricate, and dangerous channel. At night when lighted the effect was grand, but the light was so brilliant that it dazzled the eyes of the pilots and prevented them from seeing objects beyond the circle illuminated, and the shadows thrown were so heavy that they took the form of obstacles. So the light was discontinued in 1886. at the instance of those who had obtained its establishment. Incandescent lights have been successfully used in the lighting of buoys. The British Government in 1885 created a commission to report upon the relative merits of electricity, gas, and oil as lighthouse illuminants. The commission indicated that the electric light stands first in the rank of lighthouse illuminants during clear weather, if expense be no matter of consideration. The exact definition of the lighted area, and the total darkness beyond this area, however, proved a positive source of danger in the case of the Hell Gate light.

Visibility of Lights. The distance at which any light can be seen, of course, depends on the height of the tower and varies with the state of the atmosphere. The greatest recorded distance at which an oil light has been visible is that of the holophotal light of Alleppi at Travancore, which has been seen from an elevated situation at a distance of 45 nautical miles. The holophotal revolving light at Baccalieu, in Newfoundland, is seen every night in clear weather at Cape Spear, a distance of 40 nautical miles. The distance from which the principal lights can be seen is limited only by the horizon. It is deemed that 250 feet is the maximum height necessary or advisable to give a light; this gives a horizon 18 miles distant. This can be extended to about 30 miles by ascending to mast-head. When a light is unduly elevated, it is often obscured by clouds and fogs.

Lighted Beacons and Buoys. For the illumination of beacons, where no light-keeper is on the spot, or of buoys comparatively near shore, electricity is the most desirable agent to produce the light. The number of lighted buoys in the United States is small, there being but 93, of which 54 are on the Great Lakes. Of these 82 are lighted with gas and 11 by electricity. The method of lighting buoys and beacons at sea by gas and electricity has already been alluded to in preceding paragraphs and under Buoy. Electric-light buoys for the purpose of defining the main entrance to New York Harbor were first put in operation in November, 1888. Each of these carries an incandescent electric lamp operated by a current generated on shore at Sandy Hook, with which each buoy is connected by a submarine cable. The lantern consists of a circular base and stout framework of brass, having curved panes of thick glass in the sides and segmental panes in the top with a ring at the top to serve as a handle. An incandescent electric lamp of 100-candle power has been in operation in the north beacon at Sandy Hook since August 16, 1889, the current being supplied from the generating station that operates the buoy lamps. During 1896 similar lamps were established in the Sandy Hook main light and in the South Hook beacon.

Fog-Signals. A prominent feature of the lighthouse equipment of all countries is the fog-signals or sound signals used to guide mariners during foggy weather. See Fog-Signals.

Statistics. According to a compilation made by Mr. Arnold Burges Johnson, chief clerk, United States Lighthouse Board, in 1889 the number of light stations in the different parts of the world was as follows:

Europe	3,309
North America	1,329
Asia	476
Oceanica	319
Africa	219
South America	167
West Indies	106
Total	5,925

The total number of lighthouses and other lighted aids to navigation in the United States in 1900 was as follows:

AIDS	Atlantic coast	Pacific coast	Lake coast	Western rivers	Total 1900
Electric lights	5	......	......	......	5
First-order lights	40	18	......	......	58
Second-order lights	16	1	3	......	20
Third-order lights	35	5	23	......	63
Three-and-a-half-order lights	3	......	8	......	11
Fourth-order lights	170	18	95	......	283
Fifth-order lights	114	7	44	......	165
Sixth-order lights	58	......	50	......	108
Lens lanterns	99	18	81	......	198
Range lenses	16	......	......	......	16
Reflectors	49	......	2	......	51
Post lanterns	425	118	109	1,396	2,048
Light-vessels in position	31	3	10	......	44
Electric-lighted buoys	11	......	......	......	11
Gas-lighted buoys	28	......	54	......	82
Total lighted aids	1,100	188	479	1,396	3,163

Bibliography. For a general description of a large number of lighthouses, consult: Heap, *Ancient and Modern Lighthouses* (Boston, 1889); also Johnson, *Modern Lighthouse Service* (Washington, 1889); and annual reports and various special reports of the United States Lighthouse Board, Washington, D. C.

LIGHTHOUSE BOARD OF THE UNITED STATES. A body organized in accordance with an act of Congress, approved August 31, 1852, and having the control and management of all lights, buoys, beacons, etc., on the coasts of the United States, and the custody of all archives, drawings, apparatus, and other property pertaining to the lighthouse establishment. This board consists of the Secretary of the Treasury as ex-officio president, two naval officers of high rank, two army officers, and two civilians, all appointed by the President. For administrative purposes the United States is divided (1903) into 16 districts, to each of which is assigned a naval officer as inspector, who has charge of all the floating aids to navigation, the supplies of the light stations, the salaries of keepers, and the disbursement of funds relating to the above objects. The inspectors are required to inspect the lights at least once every three months, at which time they ascertain the condition of the station and report it to the board. Every district has also an engineer officer of the army as district engineer; his duty is to superintend the construction and renovation of the fixed aids to navigation. When the Lighthouse Board receives petitions for the erection of new lights the matter is referred to both the district officers for their opinions as to the necessity of the light and its proper location; the district engineer also submits plans and estimates of the cost of the proposed structure. The board then decides as to what should be done and makes a report to Congress through the Secretary of the Treasury. Should Congress make an appropriation, the district engineer is charged with the erection of the light, which must be done by contract after due advertisement. When the lighthouse is completed the keepers are appointed and the structure placed in charge of the district inspector. The Lighthouse Board has offices in Washington, depots for supplies in various districts, and a number of vessels for conveying supplies and performing other necessary duties.

LIGHTNING (ME. *lightnyng*, illumination, from *lighten*, light). A brilliant flash of light between clouds, or between a cloud and the earth. These flashes were shown by Benjamin Franklin to be simply enormous electrical discharges. The length of such a flash may be several miles. When the flashes are between the lower clouds and the earth they are comparatively narrow and brilliant and are accompanied by thunder, but when they take place in the upper cloud region they become more diffuse and thunder is rarely heard. Three general classes of lightning are recognized. The first of these is the forked or zigzag lightning, which is a line of light of intense brilliancy, appearing to the eye as a single blinding streak of light, which sometimes breaks into one or two branches and is often of a rosy or violet tint. The second class of lightning is called sheet lightning; this has no definite form. It is generally of a rosy or red tint and appears in the distant horizon lighting up the clouds, dust, or haze in the atmosphere. A true sheet-lightning discharge is rare, but the ordinary appearance of sheet lightning is very common, being due to the illumination of the clouds and haze by flashes of lightning which may be beyond the horizon, and thus become manifest although distant one or two hundred miles. The third kind of lightning is the so-called ball lightning, which is said to appear like a small globe of brilliant light moving slowly through the air at a short distance above the ground or even rolling along the ground itself. Reliable observers have stated that on some occasions ball lightning has been seen to roll slowly into a house through an open door or window; it generally breaks up with an explosion, which, however, is not very destructive or dangerous. The descriptions of this phenomenon present many points difficult to understand, and it is only of late years that electricians have been willing to admit that we have here a true but peculiar form of electric discharge that demands further experimental investigation. Very minute discharges analogous to ball lightning have been produced in the physical laboratory. The silent electric discharges known as Saint Elmo's fire (q.v.) are not usually included under lightning.

The thunder that accompanies lightning seems to be satisfactorily explained by the fact that the electric discharge in forcing its way through the atmosphere heats the air and the vapor lying in its path to a very high temperature, causing a very violent expansion along the whole length of the flash, simultaneously followed by an equally rapid contraction and the production of a wave of expansion and compression, or what is the same thing, a noise. Owing to the refraction of sound as it travels through the atmosphere, and especially the irregular refraction due to the temperature and wind, thunder does not travel very far before it begins to rise above the ground, so that observers frequently see flashes of lightning without hearing the thunder which has passed over their heads. Thunder is therefore rarely heard at a distance of 15 or 20 miles, whereas discharges of artillery may be heard 30, 50, or 100 miles.

Beginning with the researches of the late Prof. Ogden N. Rood, of Columbia College, and with the results obtained from the recent applications of photography, a few definite facts have been added to our knowledge of the nature of lightning. Professor Rood was able to show that a so-called single flash which may last several tenths of a second is simply an irregular succession of elementary flashes each of which lasts but a few thousandths of a second, or even less. Prof. John Trowbridge, of Harvard University, has constructed a storage battery of minute cells, by means of which he has been able to imitate true lightning flashes of several yards in length. Prof. Joseph Henry was able to show that all electric discharges are of an oscillating or alternating nature. The individual oscillations take place in a few millionths of a second and rapidly die away in intensity so that the whole discharge is accomplished in a very short time, depending on the size and distance of the electrified bodies. Now as lightning is evidently a simultaneous discharge from myriads of electrified drops toward numerous spots on the earth's surface, or toward a similar electrified cloud at a distance, it is therefore a rational hypothesis to assume that the numerous discharges observed by Rood as constituting one flash were simply a grand example of Henry's oscillatory dicharge. The truth of this hypothesis is confirmed by the numerous photographs of lightning that have been taken within the past ten years. One of the most remarkable of these was taken by W. H. Jennings, of Philadelphia, August 12, 1892, from the rear platform of a railroad train in full motion crossing the prairie of North Dakota; this was simply an example of what is now called 'ribbon lightning.' A fine illustration of a ribbon flash is shown in the accompanying figure. This photograph was taken by J. M. Justice, of Frankford, Pa., between 9:00 and 9:30 P.M., August 10, 1899. The plate shows a small single flash to the left of the centre and a vivid broad multiple flash a little to the right of the centre. The latter flash was between 2000 and 3000 feet distant from the camera; it descended from the cloud to the earth at an inclination of from 20 to 40 degrees, apparently striking the ground within a mile to the north. The angular breadth of the flash, as photographed, is about 32 minutes of arc near its summit and about 18 minutes near the horizon, representing a linear breadth of between 14 and 24 feet.

Two distinct explanations have been offered of multiple flashes as seen in photographs. According to one, the first flash makes, as it were, a hole in the air, and succeeding discharges quickly pass up and down through this tube, while the general wind of the atmosphere carries it along for a few feet. According to the other explanation the hole or tube of rarefied air lasts so short a time that the motion of the wind is inappreciable, but it is of such a great diameter that the successive discharges passing up and down within it side by side, or one within the other, appear as separate streaks of light. Neither of these explanations can be said to be satisfactory. Somewhat similar flashes can be produced artificially by blowing across a discharge between two electrodes. Photographs often show a dark flash among the bright ones, but this is known to be a photo-chemical effect on the sensitive plate and not atmospheric.

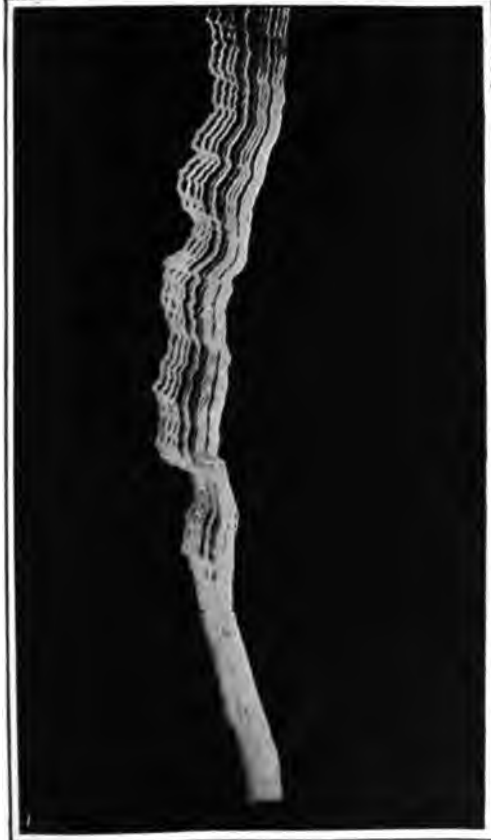
The researches of Trowbridge seem to show that the resistance of atmospheric air to electrical discharges becomes less as the voltage increases beyond some high number such as a million volts; when the first or pilot discharge has taken place the air offers less resistance to the succeeding discharges. Under powerful electric stress a resisting medium seems completely to lose its power of resistance and is immediately ruptured. Consult: Lodge, *Lightning Conductors and Lightning Guards* (London, 1892), and the bulletin of the United States Weather Bureau on *Protection from Lightning*, by Alexander McAdie.

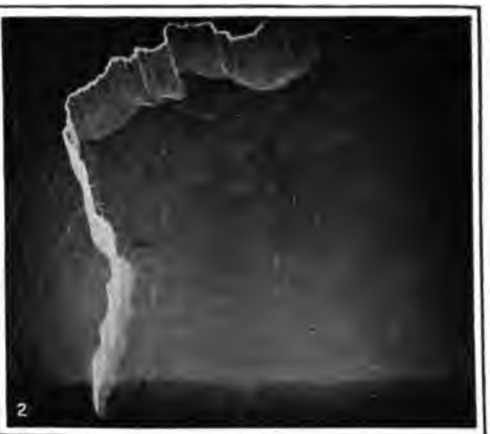
The frequency of occurrence of lightning and thunder storms is published regularly in the *United States Monthly Weather Review*, and the annual summary shows that the number of days on which thunder-storms were reported varies from 100 at any station in Louisiana and Florida to 5 or even 1 per annum at special stations in Arizona, California, Maine, Nevada, North Dakota, Oregon, and Washington. It is suspected that there is some relation between the aurora and the lightning, since on many occasions numerous thunder-storms have been recorded around a central region where clear skies and auroras were observed.

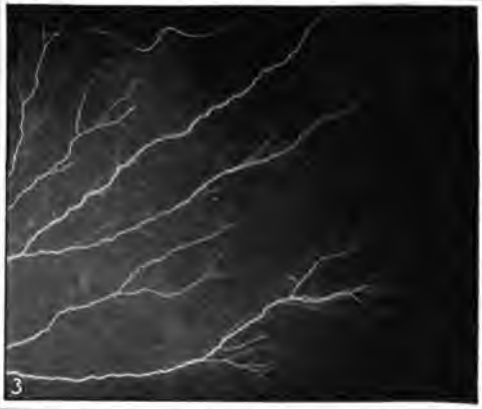
LIGHTNING, Accidents from. Statistics have been kept for many years, both in Europe and America, showing the frequency of lightning strokes and the destruction done by them. Thus, according to the report of the Registrar-General for England, in 1871, 28 persons were killed; all but 5 were men and were chiefly laborers in the open air. In 1875 17 were killed, and in 1877 only 10. Out of 103 deaths in five years (1852-56) there were 38 in July and 22 in August. According to Hellmann, in Schleswig-Holstein, during the decade 1874-83, the annual average of destructive lightning strokes per million of buildings was 163 for slate or metal roofs, 386 for wooden or thatched roofs, 6277 for chimneys, 8524 for windmills, and 306 for factories and steam chimneys. The danger to buildings in the open country is five times greater than in the cities. The number of deaths of human beings on the average of fifteen years per million is 4 in Prussia and Baden and 3 in France and Sweden. The danger to buildings erected on chalk or marl is very small, but on clay or sand larger. Among forest trees the oak is most frequently struck and the beech least frequently. The records from 1833 to 1882, according to Von Bezold, show that there is a steady increase in the recorded number of strokes; possibly this may be explained by the increased care in collecting data. According to Prof. A. J. Henry, the records of the United States Weather Bureau show that during 1898 throughout the United States, excluding Alaska, the number of deaths by lightning was 367, and the number of injuries 491. The proportion of deaths to the population was greatest in the Upper Missouri Valley and portions of the Rocky Mountain region. The proportion of deaths by lightning to the total population was about 5 per million, which is higher than the average of most countries, owing to the large proportion of our agricultural population. Nine hundred and sixty-six barns or sheds, 735 dwellings, stores, or offices, 95 churches and schools, and 70 other buildings were struck and damaged, the approximate loss being about $1,500,000. Of the buildings struck 40 were provided with lightning-rods, 855 were not; and in 952 cases this item was not recorded. Nine hundred and sixty-four head of cattle, 306 horses, 30 mules, 426 sheep, 116 hogs were killed, the total value of the stock being $48,257. The continuous barbed wire fences that are used over the Western prairies are said to increase greatly the number of cattle killed by lightning, as these seek shelter in some corner of the field and the lightning runs to them along the wire from very considerable distances.

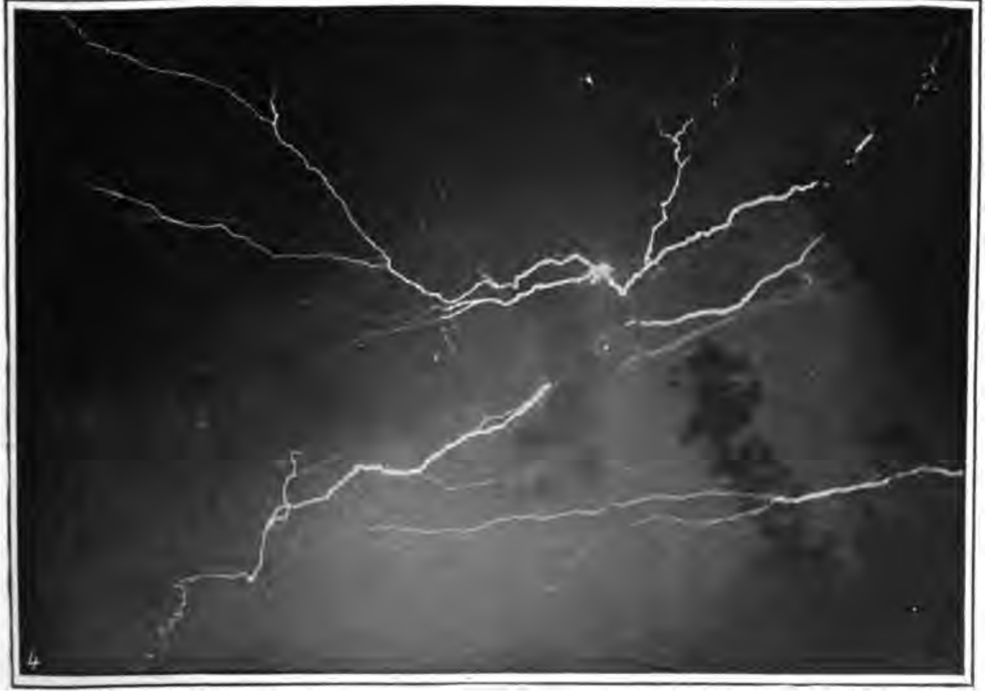
LIGHTNING, Protection from. When a flash of lightning strikes any object on the ground it generally does some destruction, apparently due to the fact that when the electric discharge passes through a poor conductor it heats that substance intensely. Thus when a discharge passes through a living tree all the sap may be converted into vapor and all the passages filled with air or filled with sap burst open. When the flash runs along a metallic water-pipe or gas-pipe it heats and melts the solder at the junctions. When the flash strikes a shingle roof it sets fire to the wood, or, striking the chimney of a house, it expands the air within the brickwork or evaporates

LIGHTNING









1. **MULTIPLE FLASH OF LIGHTNING**, photographed Aug. 10, 1899, Frankford, Pa., by J. M. Justice.
2. **RIBBON FLASH OF LIGHTNING**, on Prairie of North Dakota, photographed Aug. 12, 1892, by W. H. Jennings.
3. **BRANCHED or TREE LIGHTNING**, photographed May 16, 1892, Philadelphia, Pa., by W. H. Jennings.
4. **BRANCHED or TREE LIGHTNING**, photographed May 18, 1898, Osage City, Kansas, by Charles O. Leo.

the water in the cracks, and thus breaks up the chimney by the explosion. When the discharge runs along the roots of a tree or an underground drain it tears up the ground by the force of the explosive expansion of the water.

In general, perfect protection from a destructive flash can only be obtained by surrounding an object with a continuous metallic covering. This need not necessarily be a metal box, but may consist of a network of wire, or even a few metallic rods properly arranged; thus for an ordinary building the rods should run vertically up and down each of the corners and horizontally along the ridge, the eaves, and every other edge or prominence on the roof; these are the exposed portions, and if they are well protected there is but slight chance that a flash will strike the building elsewhere. A partial protection is of course provided for by a single metallic wire or so-called lightning-rod, especially if the upper end protrudes far above the building, but it is quite deceptive to suppose that any definite rule can be offered for calculating the so-called area of protection.

The conductors usually found on buildings have as their terminals sharp cones or prongs of copper which are gilded to protect the points and to prevent corrosion, while the conductors themselves are generally in the form of a metal rod, rope, or ribbon, and terminate either in plates buried in damp ground or by making connection with water or gas pipes. Modern authorities agree that the more points along the ridges and eaves of a roof, the greater the amount of safety, and these of course should point to the sky. A factory chimney or steeple in the neighborhood is apt to attract the lightning and in all cases should be protected by conductors, as it may be a source of danger to surrounding buildings and not a safeguard as is commonly supposed. The lightning-conductor should be of iron or copper, and if the latter material is employed, it is considered advantageous to use it in the form of tape weighing about six ounces to the foot. Iron, however, answers as well, being preferred by some authorities, and can be used in the shape of rod or tape with a weight of about thirty-five ounces to the foot. The lightning-conductor should be of the same material and continuous throughout, joints being either avoided or constructed most carefully. In its course to the earth care should be taken not to have sharp bends, corners, or curves. An important consideration is the connection with the ground, and while it is possible to connect directly with water-pipes, an independent ground is far better; running water, a deep well or boring, can be utilized with great advantage as a terminal for the conductor. A ton of charcoal or coke buried in the ground and a trench filled with the same material and leading to water also make a good ground.

In the United States there are few lightning flashes so intense that a good lightning-rod, well earthed, will not provide an easy path for the lightning; and while such protection is not necessary for houses in the city built in close blocks with metallic roofs and cornices, yet for barns and dwellings in the country authorities unite in pronouncing good lightning-conductors eminently desirable.

The Washington Monument at Washington, D. C., has furnished one of the best instances of the effectiveness of lightning-conductors as a protective device. As it stands 555 feet in height in the centre of flat and well-watered ground, it should be a conspicuous mark for lightning. It is protected by means of four copper rods attached to the aluminum cap of the pyramidion at the top, and connecting with the uprights supporting the elevator machinery. These copper rods are connected to each other by additional copper rods, and every five feet along the system there are copper points, numbering in all about 200. In the fifteen years elapsing since this improved arrangement was introduced, the monument has not been injured in any way by lightning. Previously, when the aluminum point was less effectively connected with the vertical supports, there was one lightning stroke, which, while causing but slight damage to the cap, nevertheless occasioned the provision of additional conductors. Dr. Oliver Lodge, the celebrated English authority on the subject of lightning-conductors, who has within a few years advanced some novel ideas on this matter which have tended to change previous theories, says, "Almost any conductor is probably better than none, but few or no conductors are absolute and complete safeguards." For further information, consult: Lodge, *Lightning Conductors and Lightning Guards* (London, 1892); and United States Weather Bureau bulletins on lightning.

LIGHTNING-ARRESTERS. Devices to protect electrical apparatus from damage by lightning. In the early days of telegraphy and telephony many accidents were caused by lightning striking the wires and running into the offices, often injuring the operator and destroying property. In order to obviate these difficulties an instrument was devised and called a 'lightning-arrester.' The original simple form is shown in Fig. 1. The three plates A, B, C are mounted upon an insulating block. For example, the plate A is connected to the ground, B to the telegraph or telephone instrument, and C to the line wire, and to the other side of the instrument. In ordinary operation the currents from the line cannot go from C across to A without going through the instrument, but if the line is struck by lightning the latter comes to C, and by reason of its high pressure jumps from the jagged edges of C over to A and B, without going through the other instruments at all, on account of their high impedance (effective resistance). Thus the so-called arrester provides a cross-cut, or short-circuit, so that the lightning reaches the earth without going through the telegraph or

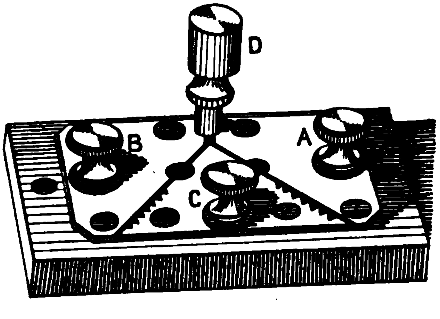


FIG. 1.

telephone apparatus. A similar device can be used where a number of lines are to be protected. When the transmission of electric power over exposed lines became general, much trouble was experienced with lightning, which would strike the line and come into the dynamos and break down their insulation at some point, passing through, and, thus establishing an arc, would 'burn out' the machine.

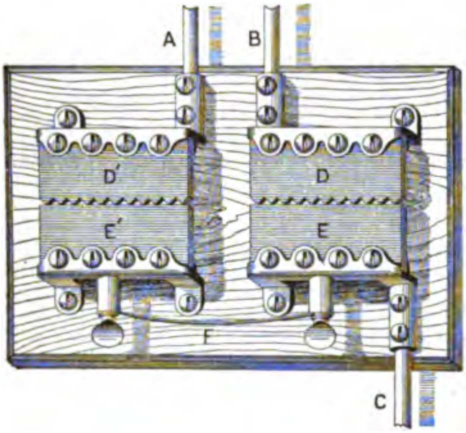


FIG. 2.

Fig. 2 shows a form of arrester used with dynamos; A and B are connected to the two sides of the circuit, and C to the earth. The lightning will jump from the toothed edges of the carbon plates D D' over to the plates E E' and thence through C to the earth. If E and E' were both connected directly to the earth, then a lightning discharge between DD' and EE' would establish a double arc, thus short-circuiting the dynamo through the ground. To avoid this difficulty E' is grounded through the small fuze-wire F, which will carry the lightning, but melts in two as soon as the heavy dynamo current starts, thus breaking the short-circuit. There are other forms of arrester in which the lightning jumps across between cylinders of so-called non-arcing metal, avoiding the use of the fuze, F, Fig. 2.

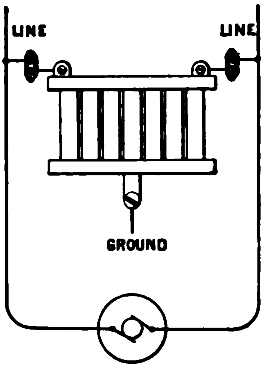


FIG. 3.

Fig. 3 shows the manner in which the arrester is introduced to protect the generator. Even the best lightning-arresters do not afford complete protection, and many serious accidents still occur.

LIGHTNING-BUG. See FIREFLY.

LIGHTNING-CONDUCTOR. See LIGHTNING, PROTECTION FROM.

LIGHT OF ASIA, THE. A poem by Sir Edwin Arnold (1878), treating of the life and teachings of Buddha.

LIGHT OF THE WORLD, THE. (1) A poem by Sir Edwin Arnold (1891), treating of the life of Christ. (2) An oratorio by Sir Arthur Sullivan (1873). (3) A painting by Holman Hunt at Keble College, Oxford, showing the Saviour standing with a lantern before a tightly closed door.

LIGHTS. Lanterns used on board ship. There are the *running lights* which are required by the 'Rules of the Road' (q.v.), and which consist of *mast-head lights* and *side lights*. In addition to these there are *signal lights* used in making signals (q.v.); *standing lights*, which are permanent lights on the lower decks or in the superstructure for lighting passageways and large compartments. It was formerly the custom to extinguish lights in the wardroom at 10 P.M., and the junior officers' quarters at 9, except when an extension of time was granted by the commanding officer. Since the introduction of electric incandescent lamps for lighting men-of-war and the separation of the wardroom and junior officers' messrooms from the staterooms the rules have become less rigid.

LIGHTS, USE OF, IN PUBLIC WORSHIP. A practice which prevailed in the Jewish (see Ex. xxv. 31-39) and most other ancient religions, and was retained in the Christian Church—not merely for the obvious purpose of illumination, but as a token of joy and with a symbolic allusion to Christ as the 'Light of the World.' This particular symbolism finds its closest application in the paschal candle which is solemnly blessed on Holy Saturday. (See EASTER.) But it is clear that from very early times, demonstrably before the middle of the third century, the use of candles and lamps was an ordinary accompaniment of Christian worship, and of the administration of the sacrament of baptism. It has been maintained uninterruptedly by the Roman Catholic and Eastern churches: at the Reformation it was abandoned by most Protestant bodies, though the Lutherans of Germany have very generally retained it, and there are a few instances of its survival in England before the practice again became general in the ritualistic movement of the nineteenth century. In numerous English instances the altar-candles remained, but were not burned. In the Roman Catholic Church their usage is strictly regulated; priests are forbidden to say mass without at least two lighted tapers; the material is limited to wax, which is used unbleached on Good Friday and in masses for the dead. Candles are solemnly blessed for public and private use on the feast of the Purification, known by the English usage as Candlemas (q.v.). A small candle called *bugia* is placed upon the altar when a bishop celebrates mass; and in the case of the Pope, seven candles are carried before him or held on each side of him in allusion to the seven golden candlesticks of Rev. i. 12. Pure olive oil is required for lamps. The red lamp burning before an altar usually, though not invariably, denotes the presence of the reserved Sacrament. For the history, consult Schmid, *Der christliche Altar und sein Schmuck* (Regensburg, 1871).

LIGHTSHIP. See LIGHTHOUSE.

LIGNE, lēny', CHARLES JOSEPH DE, Prince (1735-1814). An Austrian soldier, diplomat, and author. He was born in Brussels, and descended from a wealthy and powerful Belgian family. In 1752 he entered the Austrian Army, in which he served with distinction through the Seven Years' War. During the reign of Joseph II. he held high military and diplomatic positions, and was particularly a favorite at the Court of Saint Petersburg. He commanded the Austrian artillery at the siege of Belgrade in 1789. When the French conquered Belgium he lost all his estates. He was one of the well-known figures of his time, and corresponded with Rousseau, Voltaire, Frederick the Great, Wieland, Schlegel, and Goethe. Of his miscellaneous works in 34 volumes, which appeared in 1790-1811, Malte-Brun has given selections in two volumes (*Œuvres choisies*, 1809). His memoirs and letters have considerable historic value.

LIG'NIFICA'TION (from Lat. *lignum*, wood + *facere*, to make.) A process in plants by which the more or less thickened cell-wall becomes impregnated with lignin, a substance which makes the wall harder and more elastic. A lignified wall is permeable to moisture, but cannot absorb or retain much. Lignification occurs in the vessels and fibrous tissue, less often in parenchyma, and reaches its highest expression in the flowering plants, where the lignified tissues constitute the wood. This tissue is also highly developed in the ferns and their allies, but in the mosses it is scanty or lacking altogether.

LIGNIN. A substance from which the cell-walls of plants are formed. See LIGNIFICATION.

LIGNITE (from Lat. *lignum*, wood). A mineral substance, which, like common coal, is of vegetable origin, but differs from it in often showing a distant fibrous or woody structure. The external form may also be preserved, and lignitized tree-trunks are not uncommon in many clay formations of recent geological age. Lignite has a brilliant lustre, conchoidal fracture, brown streak, and often open texture; in fact, it closely resembles charcoal. It contains from 55 to 65 per cent. of carbon, burns readily but with a smoky flame, and is inferior to true coal in its heating power. Owing to its open texture and the high percentage of moisture which it often contains, lignite disintegrates rapidly on exposure to the air, and hence it cannot be stored for a long period or transported to a great distance without danger of its crumbling to a powder. Lignite occurs in beds in the same manner as true coal, and forms large deposits in some formations, especially those of Cretaceous and Tertiary age.

The following table gives the composition of some American lignites:

	1	2	3	4	5
	%	%	%	%	%
Fixed carbon......	34.235	33.82	31.56	45.57	49.72
Volatile carbon..	42.15	34.15	35.94	37.15	35.48
Ash....................	10.00	14.55	12.20	3.85	8.00
Sulphur..............	....	2.99	....	....	....
Moisture	13.015	14.47	20.30	13.43	6.80

1. Monte Diablo, Cal. 2. Ouachita County, Ark. 3. Calvert, Texas. 4. Golden, Colo. 5. Carbon, Wyo.

Deposits of lignite are known to occur in many parts of the world, including Central and South America, India, and China. It also occurs in large quantities in Europe and Great Britain, that mined in Germany being an important domestic fuel. In the United States deposits of lignite are found in the Cretaceous and Tertiary formations of the West, but there are practically no deposits of commercial importance in the East. Those best known in this country occur in Texas, New Mexico, Colorado, Utah, Wyoming, Montana, North Dakota, Oregon, and California; but since good bituminous coals occur in most of the States just mentioned, the lignites are at the present time of little commercial value. The markets for lignite are usually at no great distance from the mines. The presence of lignite of fair quality in California is of indirect value, since it tends to exert a regulating influence on the price of Australian coal imported into that State.

As a fuel lignite may be used in the form in which it is mined, or ground and pressed into blocks or bricklets, a small amount of bituminous matter being required to bind the material together. This is the form in which large quantities of lignite are used in Germany. Lignite can also be utilized in the manufacture of producer gas.

Jet is a variety of lignite of coal-black color, and so dense that it can be easily carved into small ornaments. It is stated by Professor Phillips to be a coniferous wood, and was first found at Whitby and other localities in England, having been known since early British times. *Brown coal* is another name for lignite, which is chiefly used in Europe. *Bovey coal* is a local name used in Devonshire, where extensive beds occur.

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LIGNUM RHODIUM (Lat., Rhodian wood). The rose-scented wood of both root and stem of Convolvulus Scoparius and Convolvulus Floridus, exported from the Canary Islands. These are shrubs or small trees with linear leaves and bell-shaped flowers. The wood is usually marketed in strong, thick, and rather heavy cylindrical but knotty pieces covered with a cracked gray bark. Internally it is yellowish, and often reddish in the heart. It has an aromatic bitterish taste, and when rubbed emits an agreeable rose-like odor. Its strong-smelling essential oil (oil of lignum rhodium), obtained by distillation, is used for ointments, etc., and also very frequently to adulterate attar of roses. A similar article of commerce is obtained from Amyris balsamifera, a native of Jamaica, which yields an essential oil, closely resembling the former. The lignum rhodium of the Levant (Liquidambar orientale) is now rarely seen in commerce. From it, however, the name has been transferred to the other kinds.

LIGNUM-VITÆ. A tropical tree. See GUAIACUM.

LIGNY, lē'nyē'. A village in the Province of Namur, Belgium, nine miles northeast of Charleroi, noted as the scene of a battle between the French under Napoleon and a Prussian army commanded by Blücher. After driving the Prussian vanguard from Charleroi on June 15, 1815, Napoleon dispatched Ney with 50,000 men to engage Wellington at Quatre-Bras, while the French right, numbering some 60,000, led by the Emperor and Grouchy, prepared to assail the Prussian army, which was drawn up more than 80,000 strong between the villages of Saint-Amand and Sombref, with its centre at Ligny. At 3 o'clock in the afternoon of the 16th, the sound of heavy cannonading announced that fighting was going on at Quatre-Bras, seven miles away. The Emperor immediately ordered an attack, and the Prussians at the first onset were driven from Ligny. They returned, however, in increased numbers and succeeded in recapturing the village, but only to lose it again. The battle was decided by a charge of the Guard and Cuirassiers through the centre of the Prussian army, which broke and fled in spite of Blücher's desperate endeavors to rally his troops. An unaccountable omission on the part of Napoleon to hurl Erlon's fresh corps on the rear of the discomfited Prussians saved the enemy from destruction. After the first moments of panic the retreat was admirably conducted by Gneisenau (q.v.), Blücher's chief of staff, who by falling back on Wavre made possible the subsequent opportune arrival of the Prussians on the field of Waterloo (q.v.). The Prussians lost about 12,000 men in dead and wounded, while the loss on the side of the French was 8000. Consult Morris, *The Campaign of 1815: Ligny, Quatre-Bras, Waterloo* (London, 1900).

LIGUESTE, lē'gĕst', PIERRE LACLÈDE (1724-78). An American trader and the founder of Saint Louis, Mo. He was born in France, emigrated to New Orleans in 1763, obtained from the authorities there the exclusive right to trade in furs with the Indians on the Missouri, organized the Louisiana Fur Company, and in 1764 founded Saint Louis (q.v.), where he continued to live until his death. His name is frequently written, incorrectly, as Pierre Ligueste Laclède.

LIGULE (Lat. *ligula*, *lingula*, diminutive of *lingua*, OLat. *dingua*, tongue; ultimately connected with Eng. *tongue*). In general, an outgrowth from the surface of a leaf or leaf-like organ. In practice the name is applied in three groups of plants, the most conspicuous of which is the grass family. The leaves of grasses have two distinct regions, the spreading portion (blade) and that which envelops the stem (sheath). At the juncture of blade and sheath the ligule appears as a more or less conspicuous flap-like outgrowth. The two other groups are the little club-mosses (Selaginella) and the quillworts (Isoetes), both of which belong to one of the great groups (Lycopodiales, q.v.) of the fern-plants (pteridophytes). In both of these cases there is an outgrowth from the surface of the leaf, which is particularly prominent in the very young stages of the leaf, and may be regarded as an embryonic structure. In other cases of such outgrowths the term ligule is not applied, but the structure is essentially the same. For example, in some flowers of the pink family there is a two-toothed outgrowth from the surface of each petal, the five outgrowths encircling the throat of the flower and resembling a small ten-toothed crown, called in consequence a corona. A similar corona is conspicuous in the various species of Narcissus, as jonquils, daffodils, etc., often forming a striking feature of the flowers. The significance of ligular outgrowths in the plant economy is quite obscure. In the case of foliage leaves, as grasses, little club-mosses, and quillworts, they seem to be structures that are of service only in the embryonic stages of the leaf, disappearing entirely or remaining only as rudiments when the blade is mature. In flowers, as in pinks and species of Narcissus, they add to the floral display, and are doubtless of service in connection with insect pollination.

LIGUORI, lê-gwō'rê, ALFONSO MARIA DI, Saint (1696-1787). A Roman Catholic ecclesiastic and theologian, founder of the Redemptorist (q.v.) Order. He was born of a noble family at Marianella, near Naples, and at first studied law, taking his doctor's degree at the age of sixteen, and beginning to practice at twenty. Six years later he abandoned the profession for the purpose of devoting himself to a religious life. He was ordained priest in 1726, and undertook with great zeal the duties of his new calling. Under the influence of Thomas Falcoja, Bishop of Castellamare, he decided to found a new congregation for missionary effort; and in 1732, at Scala, near Amalfi, he organized the 'Congregation of the Most Holy Redeemer,' which Pope Benedict XIV. approved in 1749, appointing the founder general for life. In 1762 he was appointed Bishop of Sant' Agata de' Goti, in the Kingdom of Naples. His episcopate was a model in every way; but, shrinking from the responsibilities of such an office, he resigned his see in 1775, after which he returned to his Order and continued to live in simple austerity until his death, at Nocera de' Pagani, in 1787. He was beatified in 1816, canonized in 1839, and solemnly declared a doctor of the Church in 1871. The special importance of his teaching is in the department of moral theology. Under the name of 'Probabiliorism,' a modification of the earlier so-called Probabilism, it has been very widely followed in the direction of consciences in the Roman Catholic Church. His most important work is his *Theologia Moralis* (1753), which grew out of an edition of Busembaum's earlier treatise published by him in 1748 (Eng. trans., abridged, 7th ed., 2 vols., New York, 1890). His complete works have been frequently published, most recently at Turin (1877 sqq.), and part of a projected English version (London, 1854-68). Consult lives by Capecelatro (Siena, 1893) and Rispoli (Naples, 1837) in Italian; by Saintrain (Tournai, 1879) and Villecourt (ib., 1863) in French; and by Dilgskron (Regensburg, 1887) in German. An English translation of the life by his disciple Tannoja (1798-1802), ed. F. W. Faber, appeared in London (1848-49). For a discussion of his moral theology, consult Gousset, *Justification de la théologie morale du Alphonse de Liguori* (Besançon, 1832); Wittmann, *Saint Alphonse et le pur probabilisme* (Gien, 1891); Meyrick, *The Moral and Devotional Theology of the Church of Rome According to the Authoritative Teaching of Saint Alfonso di Liguori* (London, 1856).

LIGU'RIA. In ancient geography, a region in North Italy. As defined in the time of Augustus.

it embraced the territory from the Ligurian Sea (Gulf of Genoa), across the Maritime Alps to the Po in the north, and from the Varus in the west to the Macra in the east. At a very early period the Ligures possessed a larger territory, extending far into Gaul, on the western side of the Rhone. They were subjugated by the Romans in the second century B.C. See LIGURIAN REPUBLIC.

LIGU'RIAN. The name now applied to the tall, dark, long-headed people about the Gulf of Genoa, Italy, and southward. Formerly the term was given under a misapprehension to the broad-headed type of Middle Europe. It is now believed that the entire Italian Peninsula was peopled by a primitive long-headed Ligurian type, underlying the modern one. The purest representatives of the ancient Ligurians are the tall, dark, and exceedingly dolichocephalic population of the district about Lucca. These modern designations come from the ancient Liguria in Northwestern Italy. Consult: Ripley, *Races of Europe* (New York, 1899); Sergi, *Mediterranean Race* (London, 1901). See ITALY, section on *Ethnology*.

LIGURIAN REPUBLIC. The name given to the Republic of Genoa in 1797, when it was obliged by Napoleon Bonaparte to exchange its aristocratic for a democratic constitution. It was ruled by a directory till 1802, when a Doge was made the chief executive. In 1805 the Republic was incorporated in the French Empire. See GENOA.

LIGURIAN SAGE. A name given to the poet Aulus Persius Flaccus.

LI HUNG CHANG, lē hụng chăng (1823?-1901). A Chinese statesman, born in Lu-chow, Ngan-hwei Province, February 16, 1823 (or 1819). He was highly educated, and passed through the various grades of scholarship, receiving the third degree (Chin Sze) in 1847. In 1849 he entered the Hanlin College. As early as 1853 he distinguished himself in the field against the Taipings. Passing through several minor offices, he became in 1864 Governor of the Kiang Provinces, in which capacity he was intrusted with the task of putting down the Taiping rebels who had continued to hold their own. With the assistance of the 'Ever-Victorious Army' under Gordon (q.v.) Li Hung Chang was successful in suppressing the rebellion. When Su-chow was captured Gordon promised that the lives of the rebel leaders should be spared, but they were all killed by Li's orders—a treacherous act, which so angered Gordon that he resigned his command. Li now became successively commander of the Chinese Imperial forces, an earl, head of the naval administration, and Viceroy of the capital Province of Chi-li. This last appointment placed him practically next the throne, and he held it for the exceptional period of twenty-four years, from 1870 to 1895. During the entire period the foreign policy of China was under his control. Without becoming a partisan of the Western civilization, he recognized the necessity of reorganizing the fighting forces of China on a modern basis, in order to meet the threatening encroachments of the European Powers and the rising influence of Japan, whose interests in Korea were coming into conflict with those of the Chinese. Under Li's supervision the army and the navy were greatly strengthened. The war with Japan found him in a position of great responsibility. He had been instrumental in bringing on the war, and he had to bear the brunt of the defeat which followed, although the inefficiency of the Chinese forces was largely due to the way in which his plans for military and naval improvement had been hampered by Chinese Court methods. It was equally a part of these methods that he should be made a scapegoat by the Emperor, and accordingly before the close of the war he was removed from office, deprived of the insignia of his rank, and sent into retirement. He was, however, recalled and invested with full powers to negotiate a peace with Japan. He was received in that country with respect and obtained terms which, hard as they were, were probably better than could have been obtained by any other person under the circumstances. In 1896 he represented China at the coronation of Emperor Nicholas II. of Russia, and then made a tour of the world, passing through Germany, France, England, and the United States, received everywhere with high honors. Upon his return to China he became the virtual head of the Tsung-li-Yamen or foreign office. He returned to the Governorship of the Kiang Provinces in 1900, but was soon recalled to the Governorship of Chi-li and his former extensive powers, because he was the only man who could be relied upon to meet the emergency in the foreign relations of the Empire produced by the Boxer outbreak. His last public task was the settlement with the European Powers and the United States of the issues raised by that trouble. He died November 7, 1901. Li Hung Chang was able, crafty, and according to European morals as well as the best teachings of the Chinese moral code, unscrupulous. He accumulated a colossal fortune in the public service. He was not a friend to the foreigner, but he believed in the value of the material civilization of the West and wished China to profit by its lesson and strengthen herself thereby. It was commonly believed that Li was not incorruptible and it was asserted that he had accepted retainers from Russia. He certainly sought to maintain a good understanding with that empire, though this may well have been only what he regarded as a necessary policy under the circumstances. In internal policies he was generally identified with the party of the Dowager Empress, though he was too shrewd to go all lengths with her radical advisers. Li Hung Chang could not, however, have been the statesman he unquestionably was if he had not preserved a certain rugged integrity of purpose. While he sought his own advantage, he served his country sincerely and was one of her few statesmen of commanding ability. He was a man of powerful physique and great capacity for work. Consult Douglas, *Li Hung Chang* (London, 1895). See CHINESE EMPIRE.

LILAC (Sp. *lilac*, from Ar. *lilăk*, lilac, from Pers. *lilaj*, *lilanj*, *lilang*, indigo-plant, from *nilah*, indigo-plant, Skt. *nīla*, Guj. dark blue), *Syringa*. A genus of shrubs and small trees of the natural order Oleaceæ. The common lilac (*Syringa vulgaris*), a native of the north of Persia, is one of the most common ornamental shrubs cultivated in Europe and North America. It was first brought to Vienna during the latter part of the sixteenth century by Busbecq, the ambassador of Ferdinand I., who also introduced the tulip into

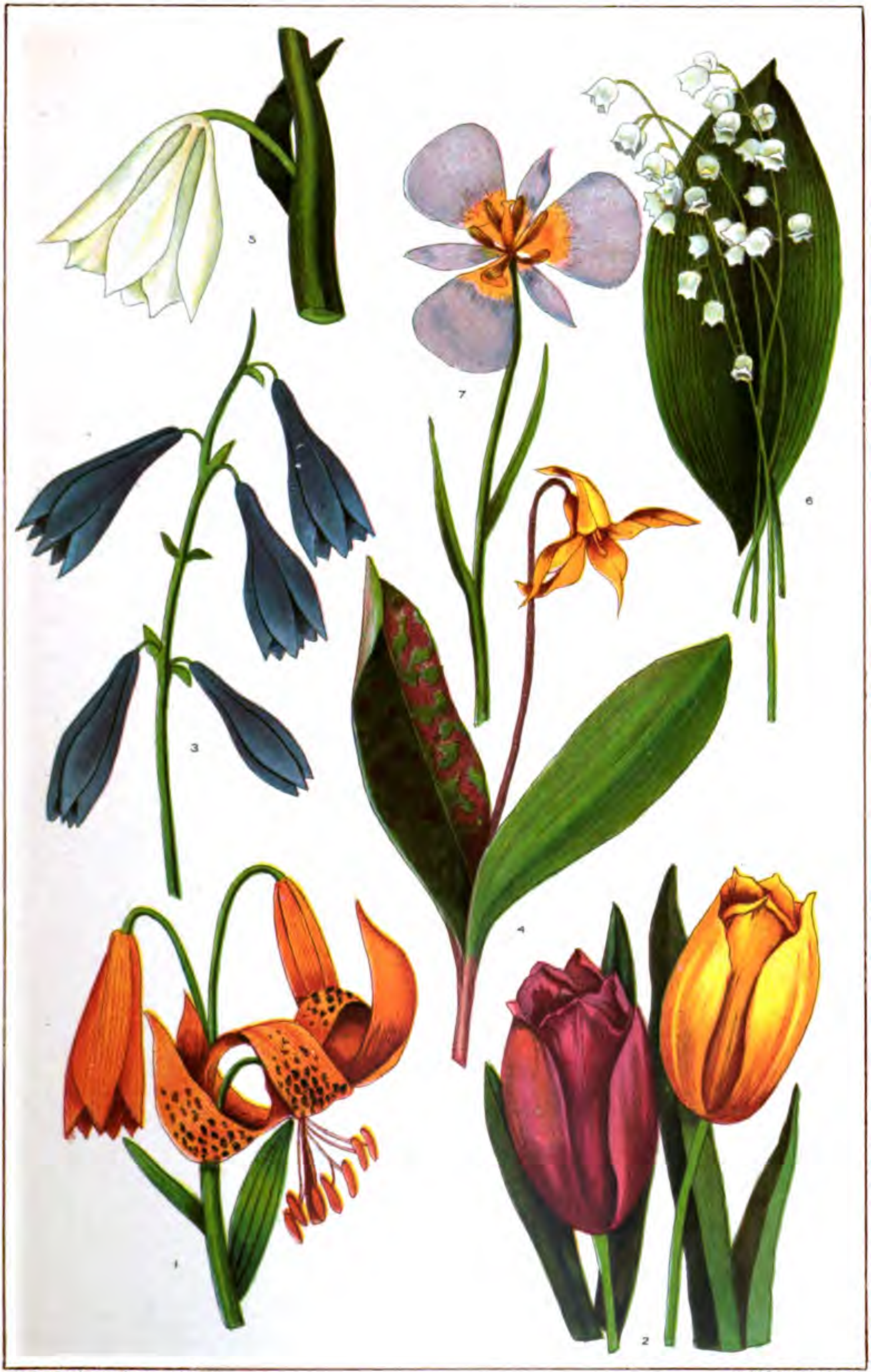
European gardens. There are many fine single and double flowered varieties. The blossoms, which appear in May in large terminal clusters, are bluish, purple, or white, and very fragrant. The plant grows from 6 to 15 feet high, and is well adapted for grouping in landscape gardening. The wood is fine-grained, and is used for inlaying, turning, and making small articles. The lilac succeeds almost anywhere, but does best upon a rich deep loam. It is usually propagated by means of suckers, which often appear too freely, or by cuttings of mature or green wood. Choice varieties, of which there are many, are often grafted on privet and common lilac stocks. Flowers may be obtained throughout the year by artificial greenhouse methods. See Plate of CALIFORNIA SHRUBS.

LIL′BURNE, JOHN (1614-57). An English agitator and pamphleteer. He was born at Greenwich, and was educated at Newcastle and Auckland. He was apprenticed to the wholesale cloth trade, but, imbibing opinions in opposition to the English Church, at the age of eighteen he went to Holland to procure the printing of a pamphlet against the bishops. This he sought to circulate secretly, but was exposed to the authorities, tried in the Court of the Star Chamber, condemned in February, 1637, to receive 500 lashes, to be pilloried and confined in prison, fined £500, and required to give security for good behavior. His courage before the judge and during his punishment gained him the sobriquet of 'Freeborn John.' Given his liberty in 1640, he placed himself at the head of the 'levelers' (q.v.) and demanded that Lord Stratford should be arraigned. He was again arrested, and taken before the House of Lords; but such was the pressure of public opinion in his favor that Parliament released him, and subsequently declared his punishment to have been illegal, barbarous, and tyrannical; and recompensed him for his imprisonment and injuries by the payment of £3000. He joined the army of the Parliament against Charles I., became lieutenant-colonel, was taken prisoner, and would have been hanged had not the Parliament's general, the Duke of Essex, threatened to hang Royalist prisoners in retaliation. He soon became dissatisfied with the Presbyterian leaders, and published charges and denunciations even against Cromwell. The latter procured his trial before a commission, by whom he was acquitted. Emboldened by this, he began a violent agitation against Cromwell, read in public a pamphlet entitled *England's New Chains*, and in consequence was committed to the Tower. Thence he poured out political pamphlets which gave him great popularity with the people. He was again brought to trial, but the pressure of popular opinion in his favor determined his acquittal. But Cromwell soon after secured his condemnation and banishment for a vicious attack on Haselrig. He then resided in Brussels and Amsterdam. After the dissolution of the Long Parliament he returned to England without permission, and was imprisoned in London Tower, in Elizabeth Castle, Jersey, and in Dover Castle, from 1653 to 1656. He was released by Cromwell after having espoused the doctrines of the Friends, or Quakers. He died at Eltham. The title of his earliest biography is *The Self-Afflicter Described* (London, 1657). For a complete bibliography of his pamphlets, consult *Notes and Queries* (London, 1888).

LIL′IA′CEÆ (Neo-Lat. nom. pl., from Lat. *lilium*, from Gk. *λείριον*, *leirion*, lily; connected with *λειρός*, *leiros*, pale, Lith. *leilas*, thin, Skt. *ti*, to vanish), THE LILY FAMILY. A natural order of monocotyledonous, mostly herbaceous, bulbous, tuberous, or sometimes fibrous rooted plants and occasionally shrubs or trees, which last are mostly tropical. There are about 200 genera and 2500 species, most numerous in the warmer parts of the temperate zone. The different members of this family exhibit wide differences in habit of growth. Many are xerophytes, some are succulents, some semi-aquatics, and a few climbers. The stem is simple, or branching toward the top, leafless or leafy. The leaves are simple, generally narrow, sometimes cylindrical, sometimes fistular. The flowers are generally large, with six-cleft or six-toothed perianth, and grow singly or in spikes, racemes, umbels, heads, or panicles. The stamens are six, opposite to the segments of the perianth; the pistil has a superior three-celled, many-seeded ovary, and a single style. The order contains many of our finest garden, greenhouse, and hothouse flowers, lily, tulip, lily of the valley, tuberose, fritillary, and hyacinth; many species useful for food, as onion, garlic, leek, and other species of Allium, asparagus, the quamash or biscuitroot (*Camassia esculenta*) of North America; many species valuable in medicine, as aloes, etc.; useful fibre is obtained from some, such as the New Zealand hemp, bowstring hemp, yucca, etc. Xanthorrhœa and Dracæna yield resins; and Chlorogalum is used as soap. Many systems of classification have been proposed, all technical and rather difficult. In that of Engler the order is divided into eleven suborders each embracing from one to many generæ. The principal genera of the United States are: Smilax, Allium, Camassia, Ornithogalum, Hemerocallis, Yucca, Convallaria, Asparagus, Erythronium, Lilium, Trillium, Veratrum, and Zygadenus. The lily family is poorly represented among fossil plants. Some scattered members appear in the Tertiary deposits, but most of the fossil forms ascribed to this family seem to be of doubtful relationship.

LILIENCRON, lē′lė-ĕn-krōn, DETLEV, Baron von (1844—). A German novelist and poet, best known as a lyrist and leader in revolutionary literary circles. He was born in Kiel, entered the Prussian Army, served in the campaigns of 1866 and of 1870-71, and was severely wounded in each. After traveling in America—his mother was born in Philadelphia—he was in the employ of the German Government until 1887, when he devoted himself entirely to literature. One of the oldest of the 'Young German' authors, Liliencron was also one of the most influential; he was a member of the Berlin 'Freie litterarische Gesellschaft' and one of the founders of the Munich 'Gesellschaft für modernes Leben.' Nearly all of the members of the new school in Germany became attached to him personally or by literary ties. His lyrics are better than his novels, among which mention should be made of the popular *Breide Hummelsbüttel* (1886; 2d ed. 1900), *Der Mäcen* (1890; 3d ed. 1900); and the *Kriegsnovellen* (1896; 4th ed. 1902); or than such dramas as *Der Trifels und Palermo* (1886). In the lyrics there is enough marching rhythm, taken with his war record, to win him the title of 'soldier poet,' and there is an especial felicity in his backgrounds of Schleswig scenery and in

LILIACEAE



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1 AMERICAN TURK'S-CAP LILY - LILIUM SUPERBUM
2 DUC VAN THOL TULIP - TULIPA SUAVEOLENS
3 BLUE DAY-LILY - FUNKIA OVATA
4 YELLOW DOG'S-TOOTH VIOLET OR ADDER'S-TONGUE - ERYTHRONIUM AMERICANUM
5 SPANISH BAYONET - YUCCA BACCATA
6 LILY-OF-THE-VALLEY - CONVALLARIA MAJALIS
7 MARIPOSA OR BUTTERFLY-LILY - CALOCHORTUS GUNNISONI

his realistic and dramatic narrative; but, on the other hand, there is no little affectation of manner. His themes are frequently erotic. His chief poetic titles are *Adjutantenritte* (1884; 3d ed. 1899); *Gedichte* (1889); *Neue Gedichte* (1893); and *Nebel und Sonne* (1900; 3d ed. 1902); as well as selections for children (10th ed. 1901). Consult the sketches by Bierbaum (Leipzig, 1892), and by Oppenheimer (Berlin, 1898).

LILIENCRON, ROCHUS, Baron (1820—). A German author, born at Plön, Holstein. He studied theology, jurisprudence, and philology at Kiel, Berlin, and Copenhagen. In 1847 he became privat-docent at Bonn. After holding various Government positions he became in 1850 professor at Kiel, and in 1852 was appointed to the chair of German language and literature at the University of Jena. While there he published, with W. Stade, *Lieder und Sprüche aus der letzten Zeit des Minnesangs* (1854). In 1858, under the direction of the Historical Commission of Munich, he began the collection of folksongs, which culminated in his *Historische Volkslieder der Deutschen vom 13.-16. Jahrhundert* (4 vols., 1865-69). The same commission also charged him with the editing of the *Allgemeine deutsche Biographie.* In 1869 he was made a foreign member in ordinary of the Bavarian Academy of Sciences, and settled in Munich, removing in 1879 to Schleswig.

LI'LITH (Heb., night monster, night fairy; connected probably with *layil,* Ar. *lail,* night). A female demon mentioned in the Old Testament. The word occurs in Isaiah (xxxiv. 14), and is translated in the English versions by 'screech-owl' or 'night monster'; it is, however, to be regarded strictly as a proper name, probably Babylonian in its origin, since in the incantation rituals of the Baylonians the demon *Lilu* and a female consort *Lilitu* occur, and are pictured as sprites that plague men particularly during the night. The Jewish Rabbinical writings contain many fables about Lilith. She is there regarded as a beautiful woman, the first wife of Adam; she became a demon, however, and Eve was given to Adam in her place. Lilith was believed especially hostile to children, and amulets were worn to ward off her pernicious influence.

LILIUOKALANI, lē'lē̇-o͞o'ō̇-kȧ-lä'nē̇, LYDIA KAMEKEHA (1838—). Queen of the Hawaiian Islands, sister of King Kalakaua, whom she succeeded in 1891. She married John O. Dominis, a native of Boston, who became Governor of Oahu, and through his influence she was at first favorably inclined to American interests. She was appointed Regent during King Kalakaua's last visit to the United States, and at his death succeeded him on the throne. Unfortunately, her husband died soon afterwards, and the Queen allowed herself to be influenced by unworthy counselors. She secured the passage of bills authorizing the importation of opium and the establishment of the Louisiana lottery, and endeavored to substitute a reactionary constitution for the liberal one of 1887. This last measure aroused the white population of the islands, who would have been disfranchised under the proposed constitution, and on January 30, 1893, they deposed her and set up a provisional government which soon became a Republic, with Sanford B. Dole (q.v.) at its head. The new Government immediately sought to secure the annexation of the islands to the United States, but President Cleveland opposed this policy, and on the ground that United States forces had been used to dethrone the Queen, demanded that the republican Government restore her to power. This Dole and his advisers refused to do, and after a show of force, President Cleveland was compelled to acquiesce. The ex-Queen visited the United States in order to plead her cause, and then retired to her private estate in Honolulu. See HAWAIIAN ISLANDS.

LILLE, lēl (Flem. *Ryssel*). The capital of the Department of Nord, France, a first-class fortress, and one of the principal manufacturing centres of the Republic (Map: France, K 1). It is situated in a level district on the navigable Deule, about 7 miles from the Belgian frontier, and 155 miles by rail north-northeast of Paris. Its fortifications, rebuilt almost entirely during the nineteenth century, consist of an extensive enceinte with numerous forts, and the pentagonal citadel at the northwestern end of the town, designed by Vauban. Lille is practically a modern town, the portion south of the Boulevard de la Liberté (formerly the southern limit of the fortifications, and now the centre of the town) having been annexed at the reconstruction of the fortifications in 1858-66. It is well laid out, and has fine squares, avenues, and boulevards, which are traversed by a number of street railways. There are few ancient buildings of note; the principal churches are those of Saint Catharine, built during the fifteenth, sixteenth, and eighteenth centuries, and containing a painting by Rubens, "The Martyrdom of Saint Catharine," La Madeleine, and Saint Andrew, with paintings by Flemish masters. The Church of Notre Dame de la Treille, a grand edifice in the style of the thirteenth century begun in 1855, is still incomplete. The secular edifices include the Bourse, dating from 1652, with a court surrounded by arcades and containing a bronze statue of Napoleon I. by Lemaire; the modern town hall (1847-59), with the communal library and a museum of engravings; and the prefectural building. The Palais des Beaux-Arts, opened in 1892, has one of the largest collections of paintings to be found in a provincial town in France, containing many canvases by Flemish, French, and Italian masters; a collection of about 1500 drawings, chiefly by the Italian masters, collected by the painter Vicar, a native of Lille; collections of antiquities, sculptures, medals, and coins, and the noted ethnographical collection of Moillet. Lille is well provided with educational institutions. The chief of them are the State University, founded in 1808, with four faculties, an attendance of about 1150, and a library of over 70,000 volumes; the free Catholic University, with five faculties and an attendance of 550; a technical high school; a lycée, an art school, a conservatory of music, a theatre, botanical and zoölogical gardens, and several scientific associations. The communal library contains 100,000 volumes, nearly 1300 manuscripts, including about 200 incunabula. Lille has long been noted for its industrial activity, especially in the textile industry. It is full of manufacturing establishments for the production of linen, velvet, ribbons, knit ware, etc., which form its chief products. There are also manufactured machinery, various instruments, chemicals, soap, sugar, trimmed lumber, tobacco, oil, etc.

The trade in local manufactures, agricultural and colonial products is extensive. Lille is the seat of a number of foreign consular agents, including one from the United States. The population of the town was largely augmented by the annexation of the suburbs during the second half of the nineteenth century. From 75,000 in 1856 it rose to 201,211 in 1891, and 210,696 in 1901.

Lille grew up around the Castle of Buc in the eleventh century. It was fortified by Count Baldwin IV. of Flanders in 1030, and by the twelfth century had become one of the chief commercial cities of Flanders and the centre of an extensive linen industry. It suffered much from the struggles between the counts of Flanders and the kings of France, and passed to the latter at the beginning of the fourteenth century. Lille regained its prosperity with its passing to the dukes of Burgundy in 1369. It subsequently came into the possession of Spain, and was conquered by Louis XIV. in 1667. It was gallantly defended by Boufflers against Prince Eugene in 1708, but was finally reduced. Another notable event in its annals is its heroic resistance during the siege by the Austrians in 1792. Consult Van Hende, *Histoire de Lille* (Lille, 1874).

LILLEBONNE, lēl'bŏn'. An ancient town in the Department of Seine-Inférieure, France, situated 20 miles east of Havre. It has a ruined castle built by William the Conqueror, an ancient donjon, and numerous Roman remains, including the ruins of a theatre. Many antique objects have been discovered in the vicinity. Lillebonne is the ancient *Julibona,* capital of the Caletes. It was of considerable importance under the Roman rule. Population, in 1901, 6425.

LIL'LIBULE'RO. The refrain of an Irish ballad, which appeared before the Revolution of 1688, and attained great popularity. The words "lillibulero" and "bullen-a-lah" (Irish) are said to have been employed by the Irish Roman Catholics during the Protestant massacres of 1641. The ballad is attributed to Lord Wharton, and the musical setting to Purcell.

LILLIPUT. The name of a fabulous kingdom described by Jonathan Swift (q.v.) in *Gulliver's Travels* (1726). The Lilliputians were no bigger than a man's finger. The term Lilliputian means a tiny dwarf, or almost anything on a very small scale.

LIL'LO, George (1693-1739). An English dramatist. A jeweler by trade, he made dramatic composition his avocation. With a vigorous style and a moral tendency in advance of his time, he was the representative of the domestic manners and tastes of the middle classes. His plays *Silvia* and *George Barnwell* appeared in 1730 and 1731. The latter was extremely popular, and delighted Queen Caroline, and, through Lessing, greatly influenced the German drama. His other works are: *The Christian Hero* (1735); *Fatal Curiosity* (1736); *Marina* (1738); *Elmerick* (1740); and *Arden of Feversham* (1759).

LIL'LY, John. An English writer of the sixteenth century, author of *Euphues.* See Lyly.

LILLY, William (1602-81). An English astrologer, born in Leicestershire. As a young man he was employed as bookkeeper by a London merchant, later took up the study of astrology, particularly the *Ars Notoria* of Cornelius Agrippa, and soon became widely known as a caster of nativities and predicter of future events. From 1644 till his death he annually issued his *Merlinus Anglicus Junior,* an almanac, containing vaticinations to which considerable importance was attached by many. His *Monarchy or No Monarchy* (1651) included, among other hieroglyphical engravings, two which he subsequently asserted predicted the plague and fire of 1666. In the Civil War he was sent to the Parliamentary camp at Colchester, to encourage the troops. After the Restoration he was for some time imprisoned, on the supposition that he was acquainted with the secrets of the republicans. He was satirized in *Hudibras.* His chief work was the *Christian Astrology* (1647). An *Autobiography* appeared posthumously in 1715.

LIL'LYVICK, Mr. In Dickens's *Nicholas Nickleby,* the uncle of Mrs. Kenwigs. He is a pompous collector of water-rates. He marries an actress, who first henpecks him and afterwards leaves him.

LILY (AS. *lilie, lilige,* from Lat. *lilium,* from Gk. *λείριον, leirion,* lily), *Lilium.* A large genus of bulbous plants of the natural order Liliaceæ, containing many species prized for their size and the beauty of their flowers. The bulb is scaly, the stem herbaceous and simple, often several feet tall; the flowers, borne at or near the summit, bell-shaped, the segments of the perianth often reflexed. The white lily (*Lilium candidum*), a native of the Levant, and long cultivated in gardens, has large, erect, pure white flowers. The orange lily (*Lilium bulbiferum*), a native of the south of Europe, with large, erect, orange-colored flowers, is a well-known and very showy ornament in flower-gardens. The Turk's-cap lily (*Lilium Martagon*), a native of the south of Europe, and allied species with verticillate leaves and drooping flowers, are also common in gardens. The tiger-lily (*Lilium tigrinum*), a native of China, is remarkable for the axillary buds which become detached and take root to form new plants that flower in from two to three years. Some very fine species are natives of North America, as *Lilium superbum,* which grows in low ground in the United States, has a stem three to seven feet high, and reflexed orange flowers, spotted with black; *Lilium Canadense,* etc. Several very fine species have been introduced from Japan, as *Lilium Japonicum, Lilium speciosum,* and *Lilium lancifolium. Lilium cordifolium* is a magnificent species, native of the Himalayas. *Lilium longiflorum,* var. *Harrisii,* the Bermuda Easter lily, is largely grown in greenhouses for winter blooming, especially for the Easter festival. The bulbs of several species are used as food in Oriental countries. Lilies are distributed throughout the north temperate zone and are grown under various conditions of climate and soil. The plants require considerable moisture during their rapid growth, but the soil must be well drained to prevent injury to the bulbs. They are propagated by offset bulbs and single scales. New varieties are grown from seeds, which is rather a slow method of increase. See Colored Plates of Liliaceæ; California Flora.

LILY, Giant, Spear, or Gigantic. See Giant (or Spear) Lily.

LIL'Y, or **LILLY,** William (c.1468-1522). A celebrated English grammarian. He graduated at Oxford, afterwards traveling in the Orient to perfect his knowledge of the Greek language, and passed a number of years at Rhodes and Rome. He returned to London about 1509, taught privately there for some time, was appointed by Colet first head-master of Saint Paul's School in 1512, and became one of the chief exponents of the 'new learning.' He was a joint author of the famous *Eton Latin Grammar*. It is probable that he was the first teacher of Greek in London.

LIL'YBÆ'UM PROM'ONTO'RIUM (Lat., from Gk. *Λιλύβαιον*, *Lilybaion*). The ancient name of the modern Cape Boeo, the western extremity of Sicily. From it to Cape Bon is the shortest distance between Africa and Sicily. Here in B.C. 397 the Carthaginians founded the city of Lilybæum (modern Marsala, q.v.) to take the place of Moty, which Dionysius had destroyed. In B.C. 279 Lilybæum was besieged unsuccessfully by Pyrrhus, and in the First Punic War the Romans endeavored in vain to reduce it; but in the final treaty of peace it was conceded to them. They made it the starting-point of the African expeditions, and the strongest fortress and most splendid city in Western Sicily. Its massive walls were surrounded by a moat 40 feet deep and 60 feet wide.

LILY FAMILY. An order of plants. See LILIACEÆ.

LILY MAID OF ASTOLAT, THE. Elaine, the maiden who died for love of Lancelot.

LILY OF THE VALLEY (*Convallaria majalis*). A well-known ornamental plant, the single representative of its genus, of the natural order Liliaceæ. It grows in bushy places and woods in Europe, Northern Asia, and in the southern Alleghany region of North America, and is also largely cultivated. The plant grows from an underground rootstock, and usually produces two ovate lance-shaped leaves from six to eight inches long. In May or June the scape with its small, white, six-lobed, bell-shaped, drooping flowers appears as a terminal, one-sided raceme. The fruit of the plant is a few-seeded red berry, about as large as a pea. The berries, roots, and flowers have a nauseous, bitter, and somewhat acrid taste, and are credited with purgative and diuretic effects. The flowers are used in the manufacture of *eau d'or*, an esteemed French perfume. Cultivation has given rise to a number of varieties with red, variegated, and double flowers. The plant succeeds almost everywhere, but makes an especially fine growth in moist, shady places on a rich sandy, well-drained loam. It is propagated by the crowns or strong terminal buds (pips) of the rootstalks. These may be obtained from established beds in the fall, but in the United States they are generally imported. The lily of the valley is largely forced by florists who obtain blossoms nearly all the year round. See Colored Plate of LILIACEÆ.

LIMA, lē'mȧ. A maritime department of Peru, bounded by the Department of Ancachs on the north, Junin on the east, Huancavelica on the south, and the Pacific Ocean on the west. Area, 13,310 square miles. The surface is very mountainous, and many peaks are covered with perpetual snow. The western part slopes gradually toward the sea, and has a number of fertile valleys along the river-courses, although large areas are occupied by sterile sand wastes. Sugar-cane is the principal crop raised in the valleys, which are among the most populous regions in Peru. Minerals are supposed to exist in large quantities, but there is very little mining. The population was officially estimated in 1896 at 298,106. The capital is Lima (q.v.). The seaport, Callao, with a few miles of the surrounding country, forms a separate province.

LIMA. The capital of Peru. It is situated on the Rimac, seven miles from where it flows into the Pacific Ocean, and from the port of Callao (q.v.), in latitude 12° 2′ S., longitude 77° 7′ W. (Map: Peru, B 6). Owing to its proximity to the Andes, the climate of Lima is very moderate, and in winter the air feels even chilly on account of the dense fogs which then prevail, and which render the climate very unhealthful. Rain, however, is almost unknown. The city is laid out in the form of a triangle, and the streets, though narrow, are straight and cross at right angles. The old city was surrounded by adobe walls, which were razed in 1870, and their sites converted into boulevards. There are several handsome promenades adorned with shade-trees and statues, and a number of squares, the foremost of which are the Plaza de la Independencia, containing a fine equestrian statue of Bolívar, and the Plaza Mayor, with a bronze fountain in the centre. On this plaza stand the cathedral and Archbishop's palace, the city hall, and the Government building. There are no parks properly so called, but the Exposition grounds form a beautiful pleasure garden with palaces, pavilions, and statues, besides zoölogical and botanical gardens. The houses of Lima are as a rule roomy two-story structures built in the Spanish style with a central *patio* or courtyard. They are almost invariably built of adobe stuccoed with plaster. Foremost among the buildings stands the cathedral, with a beautiful Moorish façade and two lofty towers; it was begun in 1535 and consecrated in 1625. There are about sixty other churches, and several fine hospitals.

The educational institutions of Lima comprise the national university, the oldest in America, having, besides the Colegio de San Carlos, faculties of medicine, law, theology, political science, and applied science. There are also schools of engineering, agriculture, and navigation, a military and a naval academy, and over 100 minor schools. There are, besides, an athenæum, scientific and literary societies, where public lectures are given, and several valuable libraries, among which the foremost is the National Library, which was founded in 1822, and contained 60,000 volumes before it was destroyed by the Chileans in 1880; it now contains about 40,000 volumes. Lima has developed rapidly in recent years; since the razing of the walls in 1870 the suburbs have thoroughly grown into the city itself, which has been greatly extended. The public works are in good condition; the city is lighted by electricity, and it has an excellent water-supply and sewerage system. The water is obtained by direct filtration from the Rimac into subterranean chambers, from which it is brought to the city in pipes and distributed by the gravity system. Lima is the chief commercial centre of the country. The Transandean Railroad, running from the Port of Callao across the Cordilleras, is here intersected by a railroad running northward through the province. The chief manufactures of the city are furniture, iron, and copper articles, pottery, and dyestuffs. The population is estimated at about 115,000.

Lima was founded in 1535 by Francisco Pizarro, who called it 'Ciudad de los Reyes' ('City of the Kings'). Its later name, Lima, is a corruption of 'Rimac,' the name of the river. During Spanish colonial times it was the capital of the Viceroyalty of Peru, which then included the greater part of Spanish South America. In 1880-81 Lima was occupied by the Chilean army, which destroyed many of its finest treasures and monuments. Consult Middendorf, *Peru*, vol. i. (Berlin, 1893).

LIMA, lī′mȧ. A city and the county-seat of Allen County, Ohio, 72 miles south by west of Toledo; on the Ottawa River, and on the Cincinnati, Hamilton and Dayton, the Erie, the Lake Erie and Western, the Detroit Southern, and the Pennsylvania railroads (Map: Ohio, B 4). It is the seat of Lima College (Lutheran), opened in 1893. The industries include several large railroad shops, manufactories of locomotives, cars, and machinery, and petroleum refineries. Lima is in the great petroleum and natural-gas belt of the State, and ships large quantities of oil. The water-works are owned and operated by the municipality. Population, in 1890, 15,981; in 1900, 21,723.

LIMAÇON, lē′mȧ′sôɴ′ (Fr., snail). A special form of the Cartesian curves. It was invented by Pascal (1623-62), and named by Roberval. Its rectangular equation is $(x^2 + y^2 - 2ax)^2 = a^2(x^2 + y^2)$ and its polar equation $r = 2a\cos\theta + k$. Consult Brocard, *Notes de bibliographie des courbes géométriques* (Bar-le-Duc, 1897; and supplement, 1899). See Cartesians; Cardioid.

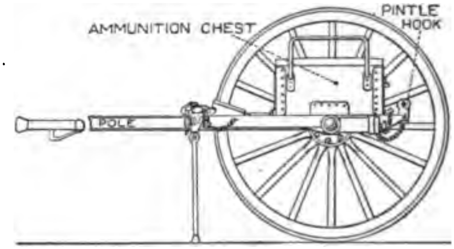
LIMA E SILVA, lē′mȧ ȧ sēl′vȧ, Luiz Alves de, Duke of Caxias (1803-80). A South American soldier and politician, born at Rio de Janeiro, Brazil. He was an efficient president successively of the provinces of Maranhão, São Paulo, and Rio Grande do Sul. On February 3, 1852, he commanded the Brazilian forces in the battle of Monte-Caseros, in which Urquiza overthrew the Dictator Rosas. He became Senator and Minister of War in 1855, and in 1856-57 and again in 1861-62 was Prime Minister. In 1866-69 he commanded the army against Paraguay with success, and on January 5, 1869, entered Asunción. He served in 1875-78 a final term as Prime Minister.

LIMA-WOOD. See Brazil-Wood.

LIMB (from Lat. *limbus*, border). In astronomy, the border or edge of the apparent disk of a heavenly body, particularly the sun and moon. The name is also applied to the graduated circle of an instrument for measuring angles. A concentric arc used for subdividing the spaces or degrees on the limb is called a vernier. There are two limbs on a theodolite, one for measuring horizontal and another for measuring vertical angles, called respectively the horizontal and the vertical limb. The graduated staff of a leveling-rod is often called a limb, the graduated scale on the vane being then the vernier.

LIMBACH, lĭm′bäɢ. A town in the Kingdom of Saxony, Germany, about 12 miles by rail from Chemnitz (Map: Germany, E 3). It manufactures hosiery, tricot, and tricot gloves, silk, pasteboard boxes, metal wares, and machinery. Population, in 1890, 11,834; in 1900, 12,241.

LIMBER (probably from Icel. *limar*, plural of *lim*, limb, bough, foliage, from *limr*, branch, AS. *lim*, Eng. *limb*). Part of the gun-carriage of a field piece. It is a two-wheeled structure fitted with boxes for the necessary ammunition, and a pole or shafts to which two horses are harnessed. At the back part is fitted a strong hook, known as the pintle-hook, to which the gun-carriage may be attached. On the march the gun points to the rear; in action the gun is wheeled around, unlimbered, or unhooked—the horses and limber seeking cover in the rear. On the command *limber up*, the limber is brought up and attached to the gun. See Field Artillery; Caisson.



LIMBER OF UNITED STATES ARMY FIELD GUN.

LIMBS, Artificial. See Artificial Limbs.

LIMBURG-ON-THE-LAHN, lĭm′bōōrk. An old town in the Province of Hesse-Nassau, Prussia, situated on the Lahn, 32 miles by rail from Coblenz (Map: Prussia, C 3). The river is here crossed by a bridge dating from 1315. The town has a magnificent cathedral, originally erected in the thirteenth century, and recently restored. It is built in Transition style, with seven towers. There is a seminary for priests. The chief industrial establishments are tobacco-factories, machine-works, breweries, and railroad repair-shops. Population, in 1890, 6866; in 1900, 8465. Limburg has in its possession the famous fourteenth-century historical document known as the 'Limburger Chronik' or 'Fasti Limburgenses,' which contains interesting information about German folk-lore and music of the fourteenth century.

LIM′BUS (Lat., border). The name assigned in Roman Catholic theology to that place or condition of departed souls in which those are detained who have not offended by any personal act of their own, but, nevertheless, are not admitted to the divine vision. A distinction is made between *limbus patrum* and the *limbus infantum*. By the former name is understood the place of the just who died before the coming of the Redeemer, and of whom it is said (I. Peter iii. 19) that He preached to those spirits that were in prison. By the latter is meant the place or state of souls of infants who die without baptism, and who suffer no torment, but are not considered capable of the beatific vision of God which is the chief joy of heaven. See Intermediate State; Hell.

LIME (Fr. *lime*, from Pers. *līmū*, *līmūn*, lemon), *Citrus Medica*, var. *acida*. A shrub of the same species as the lemon, seldom more than eight feet in height, with an irregular spreading habit of growth and crooked trunk. The fruit is similar to that of the lemon, but smaller and more nearly globular in outline; more acid and with a thinner rind. The plant is a native of India and China, cultivated in the south of Europe, the West Indies, and Florida, where it is frequently found as an escape. The lime is chiefly valued as a source of citric acid, and for lime-juice, which is extensively used on shipboard as an anti-scorbutic. It is also used to make limeade, a pleasant beverage. The limes on the American markets are mostly derived from Florida or the West Indies. The lime is propagated by cuttings or buds like the lemon, and requires similar treatment as an orchard plant. See Colored Plate of Citrus Fruits.

LIME, or Calcium Oxide, CaO. A well-known compound of calcium and oxygen, produced by heating some form of calcium carbonate or calcium nitrate. Being an energetic base, lime readily combines with acids, even carbonic acid, and hence is not found free anywhere in nature. The forms of calcium carbonate technically used for the manufacture of lime, all more or less impure, include limestone, marble, calc-spar, sea-shells, etc. The best lime is yielded by the densest limestones, the quality of the lime depending further upon the duration of the heating process and the degree of heat to which the limestone is subjected. The heating process is carried out in kilns, a good draught being required to render it effective. It is well that the limestone should contain a certain amount of moisture, the latter aiding the decomposition of the carbonate. Various methods have been devised for adding moisture to the carbonate during the process of heating; thus, a current of steam passed over the carbonate, or a spray of water thrown upon it from time to time, accelerates the process very effectively. The limestone was formerly heated in heaps or ditches, but at present this is scarcely ever practiced on a large scale, the process being carried out in either intermittent or continuous kilns, the type of which is chosen according to the available fuel. The most efficient kiln is the ring kiln, or Hoffmann kiln. (See Kiln.) Nearly as efficient, and more generally used, are vertical chamber kilns. (See Kiln, section *Continuous Kilns.*) The kilns may be provided with fireplaces, the fuel and the limestone being separated; or else there may be no separate fireplace, the limestone being charged together with the fuel. The latter form of kilns is convenient for most ordinary purposes; but if it is desired to produce a lime of high quality and of a pure white color, fireplace kilns alone should be employed. An economical form of kiln largely used at present is the iron-shell draw kiln, which holds the materials in a shell of heavy tank-iron.

Pure calcium oxide (quicklime, or burned lime) is a perfectly white substance having the specific gravity 3.15. It is not affected by heat. When brought into contact with water, it forms the hydroxide $Ca(OH)_2$, commonly known as *slacked lime,* the ease with which the transformation takes place depending largely upon certain details of the process employed in making the quicklime, such as the duration of the process, the degree of temperature, etc. Calcium hydroxide has a much lower specific gravity (2.08) than quicklime. When shaken up in water, it remains in suspension for a considerable length of time, forming what is known as 'milk of lime.' A small amount of the lime actually goes into solution, and on filtering may be precipitated by carbonic-acid gas, with which the hydroxide readily forms calcium carbonate, while quicklime refuses to absorb the gas at ordinary temperatures. Unlike that of most other substances, the solubility of lime in water decreases as the temperature increases, and hence clear 'lime-water' becomes turbid when boiled. When mixed with peroxide of hydrogen, lime-water yields an unstable hydrated *calcium peroxide,* $CaO_2.8H_2O$, which separates out in the form of minute crystals.

Lime is used for a variety of purposes in the arts. It was formerly much used in the manufacture of sugar, the latter forming with it a chemical compound that can be readily separated from the molasses and purified. To reobtain the sugar, the lime compound was treated with carbonic-acid gas, which combined with the lime and set free the sugar. At present, however, strontia is generally used instead of lime. Lime is extensively used in making mortars and cements for building purposes, and in manufacturing artificial stone and glass. It is also often employed as a medicinal agent, being prepared for this purpose from the purest varieties of calcium carbonate. It is prescribed mainly in the forms of lime-water (sometimes mixed with glycerin), lime liniment ('carron oil,' made by mixing equal volumes of lime-water and linseed oil), syrup of lime (made up of lime, sugar, and water), and Vienna paste (lime and caustic potash). The last-named preparation is often used as a caustic for the removal of warts. Lime liniment is used for burns, although a strong solution of picric acid (q.v.) is preferred by many. A mixture of lime-water with glycerin is useful in weeping eczema. Lime-water (with milk) is also often administered internally, especially for the purpose of allaying vomiting in infants. The carbonic-acid gas produced in the manufacture of lime may be collected and utilized. (See Carbonic-Acid Gas.) Consult: Frash, "Lime and Lime Burning," in *The Mineral Industry* (New York, 1899); Burnell, *Rudimentary Treatise on Limes,* etc. London, 1887); Gillmore, *A Practical Treatise on Limes* (New York, 1896). For information on the carbonates of lime, see Limestone; Marble; Calcite; Iceland Spar; and Aqueous Rocks. For the sulphate of lime, see Gypsum and Sulphuric Acid. For the nitrate of lime, see Nitric Acid. For the phosphates of lime, see Phosphorus; Fertilizers. For chloride of lime, see Bleaching-Powder.

LIME, Chloride of. See Hypochlorous Acid; Bleaching-Powder.

LIME LIGHT. See Drummond Light.

LI'MEN (Lat., threshold). A metaphorical expression introduced into psychology by Herbart. The ideal boundary or limit, which ideas or representations may be said to cross on becoming conscious, was termed by him the 'limen of consciousness.' The word was then transferred by Fechner to psychophysics, where it is employed in two principal connections. (1) The effect of a stimulus upon the organism may, for various reasons, be so slight as to produce no change in consciousness. A sound may be too faint, a point of light too small, a scent too weak, to arouse the corresponding sensation; or, on the affective side, an occurrence in the outside world may be of so little importance to us that we take it indifferently, are not 'affected' by it whether for pleasure or for unpleasantness. All stimuli of this kind are called subliminal. On the other hand, stimuli of a certain intensity or duration or extent, and occurrences of a certain importance, never fail, under ordinary circumstances, to evoke a conscious response; such stimuli are called supraliminal. Between the two lies the stimulus which is just able, in a given case, to arouse a sensation or set up an affection: this just noticeable stimulus is called the *stimulus limen*. In the sphere of sensation the limen may be intensive, extensive, qualitative, or temporal. We may seek to determine, e.g. the least intensity of pressure that will excite a sensation in the cutaneous pressure-organs, or the least intensity of sound that can still be heard; the smallest extension of pressure or of light that is able, under constant conditions of duration and intensity, to produce sensation; the least number of air-vibrations that can arouse the tonal quality to which their period corresponds; the least duration of a given color or temperature that can evoke its appropriate sensation. In every case the limen is the just sensible minimum of stimulation. The affective limens, owing in part to difficulties of experimentation, but chiefly to the dependence of the affective reaction upon the whole contents of consciousness, have not been worked out. (2) What holds of stimuli holds also of differences between stimuli. Two colors may be so nearly alike as to be sensed identically; the stimulus difference is subliminal. Or, they may be so different as, normally, to be sensed differently; the stimulus difference is supraliminal. Between the two lies a color difference that, in the given case, is just noticeable; such a difference is called the *difference limen*. The ascertainment of this value is of extreme importance in psychophysics; its absolute or relative constancy determines the absolute or relative constancy of the sensible discrimination. (See Discrimination, Sensible.) The most elaborate of the psychophysical measurements methods are concerned with it. See Psychophysics.

The stimulus limen is, evidently, at the same time the limen of consciousness. Wundt distinguishes from this a limen of attention or of apperception. Any impression which has passed the limen of stimulus (i.e. of consciousness) is able, "provided the subjective factor of attention be superadded," to pass the limen of 'clearness'; and there are many degrees of clearness, as there are many degrees of supraliminal stimulus-value. While, however, we cannot question the theoretical significance of a distinction of the two limens, it is exceedingly doubtful whether consciousness is capable at any one time of more than two degrees of clearness. See Attention. Consult: Herbart, *Werke*, vol. v. (Leipzig, 1886); Fechner, *Elemente der Psychophysik*, vol. i. (ib., 1889); Wundt, *Physiologische Psychologie* (ib., 1902); Kuelpe, *Outlines of Psychology* (New York, 1895).

LIME PLANTS. Plants which grow naturally in soils or rocks rich in calcareous compounds. See Rock Plants.

LIM'ERICK. An inland county of the Province of Munster, Ireland, separated by the Shannon on the north from Clare, and bounded east by Tipperary, south by Cork, and west by Kerry (Map: Ireland, C 4). Area, 1064 square miles. A mountainous district on the west belongs to the great coal-tract of Munster, but the coal is of an inferior quality, and is chiefly used for the burning of lime. The soil in general is fertile, especially in the district called the Golden Vale. The capital is Limerick. Population, in 1841, 331,000; in 1901, 146,000.

LIMERICK. A city, civic county, and port, capital of County Limerick, Ireland, on the Shannon, 120 miles west-southwest of Dublin (Map: Ireland, C 4). It occupies both sides of the river, together with King's Island. It is divided into the English town, the oldest part of the city connected with the extensive suburb of Thomond Gate on the Clare side of the Shannon, and the Irish town, which extends on the south bank of the river into Newtown Pery, the best part of Limerick. The gas-works, water-supply, and other public utilities are municipal property. Among the noteworthy buildings are Saint John's Catholic Cathedral and Saint Mary's Anglican Cathedral. Limerick is a military station for infantry, artillery, and cavalry, with barracks within the walls of King John's Castle, an important and well-preserved old Norman fortress defending Thomond Bridge. The Shannon, crossed by several bridges, is navigable for ships of large burden, and is connected with Dublin by the Grand Canal in Kings County, and the Royal Canal near Longford. The river is canalized to the head of Lough Allen. The graving-dock admits vessels of 2500 tons, and there is a patent slip for vessels of 500 tons, and a floating dock for vessels of 3000 tons. The industries include the manufacture of the celebrated Limerick fish-hooks, flour-milling, bacon-curing, lace-manufacturing, tanning, etc. A large import trade is carried on to the value of between £800,000 and £900,000 annually, Limerick ranking fourth among Irish ports. The chief export is oats; imports, grain, petroleum, sugar, and timber. The United States is represented by a consular agent. The ancient Regia of Ptolemy, Limerick, from its position on the Shannon, was long an object of desire to the Danes, who occupied it in the middle of the ninth century, and held possession till reduced to a contributary condition by Brian Boroimhe, in the tenth century. It was early occupied by the English, and in 1210 King John visited and fortified it. It was assaulted and partially burned in 1314 by Edward Bruce. It was occupied by the Catholic party in 1641, but surrendered to Ireton in 1651. At the Revolution, it was the last stronghold of King James. Having been unsuccessfully besieged by William after the victory of the Boyne, it was regularly invested in 1691 by General Ginkel, and after a vigorous and brilliant defense of several weeks, an armistice was proposed, which led to the well-known 'Treaty of Limerick,' the alleged violation of which has been the subject of frequent and acrimonious controversy between political parties in Ireland. The so-called 'treaty stone' still marks the spot, near Thomond Bridge, at the entrance of the suburb, near Thomond Gate, where this treaty was signed. Population, in 1891, 37,155; in 1901, 39,873. Consult: Lenihan, *Limerick, Its History and Antiquities* (2d ed., Dublin, 1884).

LIMESTONE. The name given to rocks which are composed of carbonate of lime, and sometimes also of carbonate of magnesia. The purest limestones known contain nearly 100 per cent. of lime carbonate, but in many others the percentage is much lower, due to the presence of mineral impurities such as silica, alumina, and ferric oxide. An appreciable quantity of carbonaceous matter may also be present. This variation in composition is shown by the following analyses:

	1	2	3	4
$CaCO_3$	99.30	52.75	45.91	35.85
$MgCO_3$	0.49	44.28	26.14	18.60
SiO_2	0.63	1.82	15.37	38.41
Al_2O_3	....	.55	11.38	5.77
Fe_2O_3	0.55			1.79
H_2O	....	1.82	1.20	
Alkalies	....	....	....	.41

1. White limestone, Adams, Mass. 2. Dolomitic limestone, Chicago, Ill. 3. Hydraulic limestone, Rondout, N. Y. 4. Calcareous sandstone, Jordan, Minn.

Origin. Limestone may be formed in several ways: (1) By the accumulation of organic remains or the growth of colonies with calcareous skeletons; the former manner of origin is illustrated when shell-fragments and foraminiferal cases collect on the ocean bottom, and the latter is shown in the growth of coral reefs. (2) By chemical precipitation. Many spring waters hold lime in solution in the form of bicarbonate, but this compound on coming in contact with the air is broken up and lime carbonate precipitated. The same change is also caused by certain minute algæ and calcareous plants found growing in ponds. The lime carbonate deposited by springs often forms beautiful incrustations on mosses and other objects. The effect of plant action is seen in the accumulation of marl in the bottom of many ponds. (3) By mechanical means. Calcareous rocks are broken down by wave-action, and the fragments strewn over the ocean bottom in time may form extensive strata.

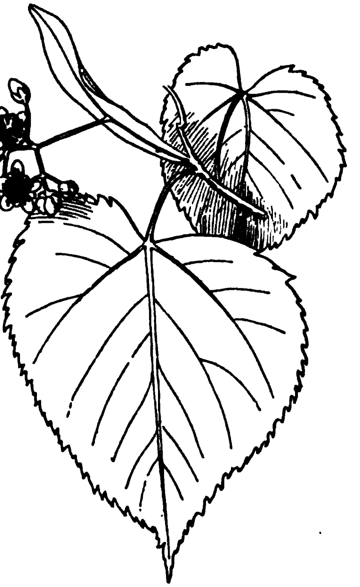
Properties of Limestone. Pure limestone is white, but the presence of even small amounts of carbonaceous matter may color it black, gray, or blue, and iron will tinge it brown, yellow, or red. The texture varies from coarse to fine, and the rock may be either crystalline (marble) or earthy (chalk); the layers range from massive to shaly. Limestone effervesces readily with cold muriatic acid unless it is magnesian, when only warm acid attacks it. Most limestones are easily soluble in water containing a slight quantity of carbonic or other acids, and hence their surface is sometimes quite uneven. The easy solubility of the rock has led to the formation of caves and sink-holes. Since both sand and clay are often washed into the waters where limestones are forming, the rock may be siliceous or aluminous in its character, and by an increase of these impurities, grades into sandstones on the one hand, or into shales on the other, the intermediate varieties being called calcareous sandstones and calcareous shales. Limestones show a wide geological distribution, being found in every system, but their greatest development is among the Paleozoic formations, where a series of calcareous beds may sometimes attain a thickness of several hundred feet. The older limestones, geologically, are commonly crystalline, due to regional metamorphism, but the later ones may at times be so either from this same cause or from contact metamorphism. The geographic distribution of limestones is equally great.

Varieties of Limestone. A number of names have been given to different varieties of limestone, of which the more important are the following: *Crinoidal limestone*, a variety containing fragments of crinoid stems. *Coquina* (q.v.), a variety composed of loosely cemented shell fragments. *Chalk* (q.v.), a white variety of limestone formed chiefly of foraminiferal shells. *Dolomite* (q.v.), a limestone containing both carbonate of lime and magnesia. *Hydraulic limestone*, an aluminous variety having the property of hardening under water after it has been burned. *Marl* (q.v.), a soft, calcareous mud, formed in the bottom of many ponds. *Marble* (q.v.), strictly speaking, is a crystalline limestone, but the term has been expanded in commercial use to include any limestone that will take a polish. *Oölite* (q.v.), a limestone composed of small spherical grains. *Saccharoidal limestone*, a coarsely granular variety. *Traverline* and *tufa*, calcareous deposits formed around the mouths of springs.

Uses. The chief use of limestone is for building purposes, for which it is found especially valuable on account of its wide distribution, dense structure, and massive character. Marble is used for decorative work. Limestone is also widely used as a road material and in the manufacture of lime (q.v.). When mixed with clay or shale in certain proportions and burned and ground it forms Portland cement. Many argillaceous limestones when burned also show hydraulic properties, and such are put on the market under the name of Rosendale or natural rock cement. Other uses of limestone are as a flux in iron and lead smelting, and in glass manufacture. When burned to lime it is employed for making mortar and chloride of lime; and is used in gas, soap, and sugar manufacture, as a disinfectant, for bleaching, in the manufacture of Bessemer steel, etc. The total value of the limestone produced in the United States in 1901 was $26,406,897. Of this amount $8,204,054 represented the value of stone sold for lime for blast-furnace flux.

Bibliography. Burnham, *History and Uses of Limestones and Marbles* (Boston, 1883); Hopkins, "Marbles and Other Limestones," *Arkansas Geological Survey Report*, vol. iv. (Little Rock, 1893); Lane, "Michigan Limestones and Their Uses," *Engineering and Mining Journal* (New York, 1900); Ries, "The Limestone Quarries of Eastern New York, Western Vermont, Massachusetts, and Connecticut," *United States Geological Survey Report* (Washington, 1896); Ries, "The Limestones of New York and Their Economic Value," *Annual Report of the New York State Geologist* (Albany, 1900). See Building-Stones; Marble; Cement; Lime; Marl.

LIME-TREE, Linden, or Linn (AS. *linden*, from *lind*, *linde*, Icel. *lind*, OHG. *linta*, Ger. *Linde*, linden; probably connected with Gk. *ἐλάτη*, *elatē*, silver fir). A name given to trees of the genus Tilia, natural order Tiliaceæ, natives of Europe, the north of Asia, and North America. The species, which number about a dozen, are very similar; graceful, umbrageous trees, with deciduous heart-shaped, serrated leaves, and cymes or panicles of rather small yellowish flowers, each cyme or panicle accompanied with a large, oblong, yellowish, membranous bract with netted veins, the flower part of which adheres to the flower-stalk. The wood is light and soft, tough, durable, and particularly suitable for carved work, and is much used by turners. The charcoal made of it is often used for tooth-powder, for medicinal purposes, for crayons, and for the manufacture of gunpowder. The fibrous inner bark is used for making ropes, mats, and other plaited work. It is also used as a healing application to wounds and sores, being very mucilaginous, and abounding in a bland sap. The leaves and in early spring the twigs are in some countries used as food for cattle, but cows fed on them produce bad butter. The flowers have an agreeable odor, and abound in nectar much sought after by bees. The celebrated nectar, much valued for medicinal use and for making liqueurs, is the product of great lime forests near Kovno, in Lithuania. The seeds abound in a fixed sweet oil. The European lime or linden (*Tilia cordata*) often attain a large size, particularly in rich alluvial soils. Some botanists distinguish a small-leaved kind (*Tilia parvifolia*) and a large-leaved (*Tilia rubra*) as different species; others regard them as mere varieties. The hooded or capuchin lime is an interesting mountainous variety. The lime-tree is often planted for shade in towns; and the principal street of Berlin is called *Unter den Linden*, from the rows of lime-trees which line it. The American lime (*Tilia Americana*), commonly called whitewood or basswood in America, has larger leaves than the European species. It abounds from New Brunswick to Virginia, and in the elevated parts of Alabama and Georgia, westward to Minnesota and Texas. It reaches a height of 80 feet or more and 4 feet in diameter. The wood is fine, close-grained and soft, easily worked, and is extensively used for furniture, carriage-boxes, turning, etc. The tree is considered especially valuable for street planting, as it is hardy, resists drought, and is less liable to injury than many others. A similar species is the downy basswood (*Tilia platyphyllos*), which occurs from New York to Florida and westward through Indiana and Illinois to Texas. It is similar to the above in its properties and characteristics. The species of basswood have been tried for paper-pulp, but the quality furnished was considered inferior to that obtained from spruce.



LINDEN.

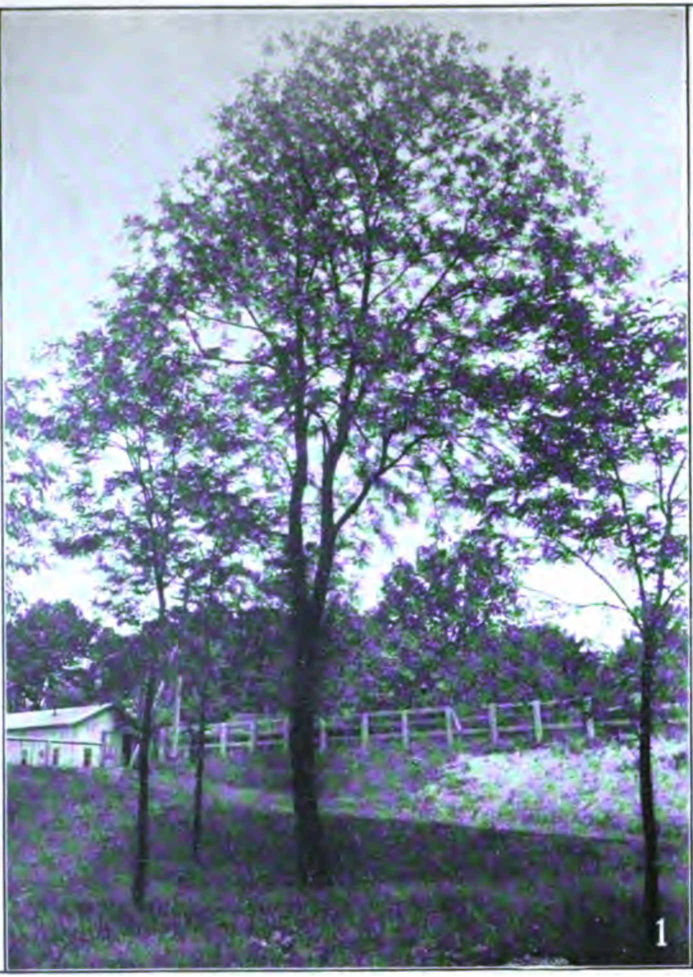
LIMFJORD, lĭm′fyôrd. A narrow passage extending from the Cattegat to the North Sea and cutting off the northern part of Jutland from the mainland.

LIMIC′OLÆ (Neo-Lat., from Lat. *limus*, mud + *colere*, to inhabit). A large order or suborder of birds, often known as the 'plover-snipe' group, differing from other wading birds chiefly in their breeding habits. They lay few eggs, usually four, and the young when hatched are at once able to run about and look out for themselves. The body is rounded or depressed, never notably compressed, as in the rails. The members of most species are of small size, and are usually found in open places near bodies of water. They feed on insects and worms, and other small animals, for the capture of which their long, slender, and sensitive bills are admirably fitted. The order is a large one and includes about a dozen families found in all parts of the world. The best known of these and the most typical are the plovers (Charadriidæ), the snipes, sandpipers, curlews, etc. (Scolopacidæ), and the avocets (Recurvirostridæ). The other families are the pratincoles (Glareolidæ), confined to the Old World; the thick-knees (Œdicnemidæ), with eight species, all but one of which are Old World forms; the jaçanas (Parridæ), rail-like birds of both hemispheres; the sheath-bills (Chionidæ), remarkable pure white birds of Kerguelen and the Crozet Islands, two species of which are known; the Thinocoridæ, a family of half a dozen gallina-like South American birds; the crab-plovers (Dromadidæ), only one species being known, an inhabitant of India and Africa; the Hæmatopodidæ or oyster-catchers, with six or eight cosmopolitan species; the Phalaropodidæ, with three boreal species, easily recognized by their lobate feet; and lastly and doubtfully the Old World bustards (Otididæ), which are perhaps more nearly related to the cranes. See Plates of BEACH-BIRDS, and of SHORE-BIRDS.

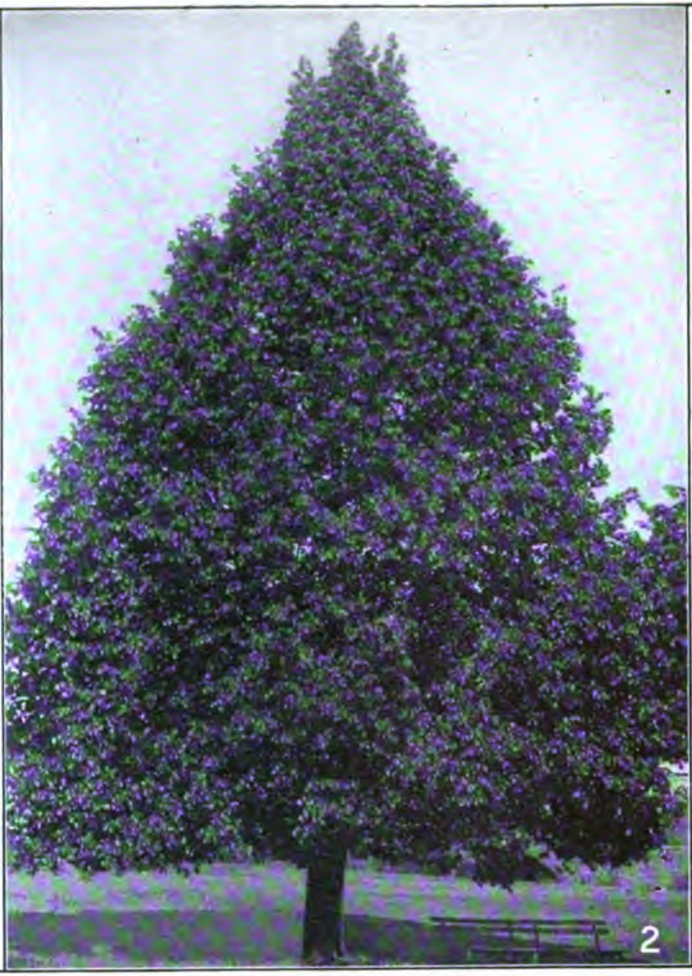
LIMITATION OF ACTIONS (Lat. *limitatio*, a bounding, from *limitare*, to bound, from Lat. *limes*, boundary; connected with *limen*, threshold). In law, the limited period of time allowed to a party in which to commence an action after his cause of action has accrued. Owing to the difficulty of preserving evidence for long periods of time, and to prevent the prosecution of claims not well founded, sound policy requires that some limit should be placed upon the time within which actions may be brought. Equity, recognizing the justice of such a doctrine, early refused relief to a plaintiff when guilty of laches (q.v.), but this limitation of actions at law is purely statutory. Statutes of limitation were enacted in the time of Edward I. and Henry VIII., and these were revised by the Statute of Limitation passed in the twenty-first year of James I. (1624), which, with slight modification, has been reënacted in most of the States of the United States.

The following are the more important periods of limitation which, with some variation, have been adopted in England and the United States.

LOCUST AND LINDEN



1. LOCUST



2. LINDEN

Actions affecting the title to real estate, or founded upon a contract under seal, must be brought within twenty years. Similar actions affecting the title to personal property, and actions founded upon such contracts not under seal within six years, and those founded upon personal tort, within two years. In many States the time for bringing equitable action is limited to ten years; and in most States there are short periods of limitation for the benefit of administrators and executors.

An action is deemed to be begun for the purpose of avoiding the statutory limitation by the delivery of the writ or summons to the sheriff or other proper officer for service. The action is not then barred by the statute even though service of process is not made until after the expiration of the statutory period. A plaintiff who is under disability when his right of action accrues is not barred by the statute until the expiration of the statutory period after the removal of the disability, or, as it is said, the statute does not run against one under a disability. Under the early statutes infancy, coverture, insanity, and absence from the country were the enumerated disabilities, but under most modern statutes only infancy and insanity are so defined.

The statutory period dates from the time that the cause of action accrues. In the case of actions founded on the right to possession of property the cause of action accrues with the adverse possession of the property.

In the case of both real and personal property uninterrupted adverse possession for the statutory period in effect vests the party in possession with a perfect title, as the real owner is barred from bringing an action.

Such possession must be of definitely bounded or ascertained property and against the consent of the owner. The possession of a tenant or of a mortgagor, being with the consent of the owner and the mortgagee respectively, is not adverse, and is not affected by the statute. See Mortgage.

In the case of actions founded upon contract the statute runs from the time when the defendant is bound to perform the contract. Thus in case of negotiable paper the statute begins to run when the paper becomes due. (See Negotiable Paper.) In case of open or running accounts the statute runs from the date of the last items of the account. In the case of all obligations to pay money a payment of interest or a part of the principal forms a new due date from which the statute begins to run anew, and a promise made by the debtor or obligor after the expiration of the statutory period revives the debt or obligation. In some States the new promise to pay is required to be in writing in order to have that effect.

In the case of torts the right of action accrues and the statute runs from the time when the tortious act takes effect or results in the injury complained of.

In most jurisdictions the defense of the Statute of Limitations is not available at the trial unless specially pleaded. See Pleading.

The term limitation is also applied in the law of conveyancing to the granting by deed or will of lesser estates out of a fee, as, for instance, the gift of a life estate to A, remainder for life to B, remainder to C. See Conveyance; Estates.

LIMITED COMPANIES. Those of which the liabilities are limited to the amount of the capital, and each of whose stockholders is liable not for all the debts of the concern, but only for debts equal in amount to his own stock. In this respect, they partake of the nature of corporations. The term is most frequently applied to joint-stock companies limited, which are organized under modern statutes, or to limited partnership associations, also creations of modern legislation. See Joint-Stock Company; Partnerships; and authorities there cited.

LIMITED LIABILITY. At common law, this could be secured only by a special contract; that is, by one to which both parties expressly assented. If an insurance or banking partnership wished to limit its liabilities to its assets, and save its members from personal responsibility for its debts, it was bound to notify the insured, or the bank depositor or holder of bank bills, as the case might be, that it would contract with him only on that basis. Under modern statutes, however, authorizing the formation of joint-stock companies (q.v.) and limited partnerships (q.v.), the term of limited liability is imported into all contracts made with such associations. Persons dealing with them are bound to take notice of the privilege accorded to them by the legislatures, but this privilege is statutory, and avails only those who have complied with the legislative requirements. Thus, if a limited company in England omits the word 'limited' from its name, its shareholders are bound to pay its debts in full.

By the general maritime law (q.v.) of Europe, a ship-owner can absolve himself from liability for the negligence of the master or crew by surrendering the ship and the freight. This rule has been adopted by Parliament in England and by the Federal Congress in this country. (See 7 Geo. II., c. 15.) Its present provisions are found in the Merchant Shipping Act, 1894 (57 and 58 Vict., c. 60), as amended by various acts especially by Merchant Shipping Act, 1900 (63 and 64 Vict., c. 32). Congressional legislation on this topic began in 1851, and is now embodied in the United States Revised Statutes, §§4282 to 4289, as amended. Under it "the owner of any vessel, whether steamer or canal-boat, employed whether in seagoing or inland navigation, whether he be an American citizen or a foreigner, may obtain a limitation to the value of his interest in the vessel and her pending freight, of his liability not only for the results of a single disaster, but for the results of a disastrous voyage, including all debts due on account of the vessel save seamen's wages." These statutory provisions apply to cases of personal injury and death, as well as to those of harm to property. If the ship and freight are lost, the owner must abandon to the injured parties all claims and causes of action having reference to the vessel and freight. If he collects these he is liable to the injured parties to the extent of the proceeds.

It is to be noticed that this limitation of liability is confined to the owners of the vessels who are not in charge thereof. The master and seamen whose misconduct causes the injuries are not exempted from liability by maritime law or by statutes. Consult Benedict, *The American Admiralty* (New York, 1898).

LIMITS, Theory of. When the difference between a variable and a constant quantity may become and remain less in absolute value than any assignable quantity, however small, the constant is called the *limit* of the variable, e.g. the sum of two, three, four, . . . n terms of the series $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\ldots$ is a variable which, by making n sufficiently large, may be made to differ from 1 by less than any assignable quantity. The variable may be always less than, always greater than, or sometimes greater, and sometimes less than, its limit. The series $1-\frac{1}{2}+\frac{1}{4}-\frac{1}{8}+\ldots$ is an example of the last, since the limit is $\frac{2}{3}$, while the sums to one, two, three, etc., terms are $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{8}$, etc. The symbol $\doteq$ is used to indicate that a variable approaches a constant as a limit; e.g. $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\ldots\doteq 1$. In algebra the limit of a given function $f(x)$ when $x \doteq a$ is defined thus: If for any positive value e, however small a number a can be found such that for all values of x, satisfying the inequality $|x-a|<a$, the corresponding values of $f(x)$ satisfy the inequality $|f(x)-b|<e$, then b is called the limit of $f(x)$. E.g. let $f(x)=x^3$, and suppose $x \doteq 0$; select c as 0.001; then (1) $|x-0|<a$, (2) $|x^3-0|<0.0001$, show that for $a=0.1$, any value of x satisfying (1) gives an x^3 satisfying (2), therefore, by making e small enough, $x^3 \doteq 0$ as $x \doteq 0$. (The notation $|x|$ stands for the *absolute value* of x.)

The fundamental propositions of limits are: (1) If two variables are always equal or in a constant ratio as they approach their limits, their limits are equal or are in the same ratio. (2) The limits of the algebraic sum of a finite number of variables is the sum of their limits. (3) The limit of the product of a finite number of variables is the product of their limits, all the quantities being finite. (4) The limit of the quotient of two variables is the quotient of the limits, if the expression does not assume the form $\frac{0}{0}$ or $\frac{\infty}{\infty}$. In case an expression of the form $\frac{f(x)}{\phi(x)}$ becomes $\frac{0}{0}$ or $\frac{\infty}{\infty}$ for a particular value $x=a$ of the variable, the true value is easily found by a rule due to L'Hôpital, which consists in replacing $f(x)$ and $\phi(x)$ by their derivatives, and, if necessary again, by their second derivatives, and so on. For exceptions to this rule and its applications, consult the works mentioned under Calculus. See also Fractions.

The theory of limits is among the most important in mathematics, the rigor of modern analysis depending upon the high state of perfection of this theory. The mensuration of curves and surfaces, the treatment of series (q.v.), and the foundations of calculus (q.v.) rest upon it. The modern methods of limits is a development of Newton's theory of prime and ultimate ratios found in the *Principia* (1687).

The *limits of the roots* of an equation are the numbers above and below which it is impossible that the roots should exist. The approximate solution of numerical higher equations consists in bringing the limits of each root as nearly together as possible.

For historical and theoretical discussion, consult Pringsheim, in the *Encyklopädie der mathematischen Wissenschaften*, vol. i. (Leipzig, 1898).

LIM′MA (Lat., from Gk. λεῖμμα, *leimma*, remnant, from λείπειν, *leipein*, to leave). An interval in the musical system of the ancient Greeks which to-day is designated as a *diatonic* semitone (a—b♭), as opposed to the chromatic semitone (a—a♯), which latter the Greeks called *apotome*. In our modern system the diatonic semitone is larger than the chromatic, but with the Greeks it was the reverse. They determined the limma by subtracting two whole tones, each in the proportion of 8 : 9, from the perfect fourth (3 : 4) and thus established the ratio 243 : 256; whereas the apotome or chromatic semitone was fixed in the proportion of 2048 : 2187.

LIMNÆ′A. See Pond-Snail.

LIMNANDER DE NIEUWENHOVE, lĭm′nän-dẽr dȧ nē′ven-hō′ve, Armand Marie Guislain, Baron (1814-92). A Belgian composer, born at Ghent. He was educated at the Saint Acheul Jesuits' College, near Amiens, afterwards at Fribourg, and later studied composition with Fétis. Upon his return to Belgium from Switzerland, he began the work of composition, and also conducted an amateur symphonic society at Mechlin. In connection with this he founded a choral society, the Réunion Lyrique, and he wrote some fine choruses for unaccompanied male voices, besides a *Requiem Mass* with organ; a *Stabat Mater*, with orchestra; a sonata for piano and violoncello; *Les Druides*, operatic scenes produced at the Paris Conservatory (1845); a symphony called *La fin des moissons;* a *Te Deum;* and some cantatas. In 1847 he removed to Paris, where his comic opera *Les Monténégrins* was presented at the Opéra Comique (1849), followed by *Le château de la barbe bleue* (1851) and *Yvonne* (1859), while his *Maître-chanteur* was given at the Opéra (1853) and again in Brussels (1870) under the title *Maximilien.*

LIMNAN′THEMUM. A genus of plants. See Villarsia.

LIMNO′RIA. See Gribble.

LIMOGES, lē′mōzh′. The capital of the Department of Haute-Vienne, France, and the ancient capital of Limousin (q.v.), situated on the right bank of the Vienne, 215 miles south-southwest of Paris (Map: France, H 6). It is a very old town, with narrow, crooked streets in the older quarters, and many buildings and monuments attesting its antiquity. The newer portions of the town, built up after the demolition of the old fortifications, are modern in appearance. The most notable building is the Cathedral of Saint Etienne, begun in 1273 on the site of an older church and completed only in the second half of the nineteenth century. The interior is decorated in Renaissance style and contains a delicately ornamented rood-loft of the sixteenth century. The town hall is a modern Renaissance building (1878-81) and has a collection of paintings and sculptures. Limoges has some Roman remains and a number of private houses dating from the Middle Ages. The educational institutions of the town consist of a lycée, a theological seminary, preparatory schools of medicine and pharmacy, a national school of decorative arts, a library of about 30,000 volumes, a museum of ceramics, and a meteorological observatory. Limoges has since ancient times been known for its artistic industries. In the Middle Ages it was celebrated for its mint and gold ware and later for its enamels. In 1736 the porcelain industry was introduced, and, favored by the discovery of fine clays in the vicinity, it developed very rapidly. It is now one of the chief centres of the porcelain industry in Europe. About 6000 men are employed in the porcelain factories of the town, and considerable quantities of kaolin are exported to other European countries and even America. A printing establishment was founded at Limoges as early as 1496 and the printing of books is among the chief industries of the town. Other prominent industries of Limoges are distilling, brewing, tanning, and the manufacturing of nails, knives, hats, gloves, paper, etc. The textile industry, once extensive, is now in a state of decline. Limoges is advantageously situated for commercial purposes, and carries on a considerable trade between Paris and the south of France. Population, in 1891, 72,697; in 1901, 84,121. At the Roman conquest Limoges was the capital of the Gallic tribe Lemovices, and a place of considerable strength and importance. It suffered greatly from the Vandals, and during the Hundred Years' War, as well as from frequent conflagrations. Christianity was introduced in the third century by Saint Martial, the first Bishop of Limoges. In 1630-31 the town was ravaged by a terrible pestilence, in which over 20,000 people perished.

LIMON, lē-mōn'. The principal seaport of Costa Rica, situated on the eastern (Caribbean) coast, at the eastern terminus of the interoceanic railroad to Puntarenas (Map: Central America, F 5). It has a good harbor, well provided with wharfage facilities, is regularly visited by five lines of steamers going to American and European ports, and is the station of a United States consular agent. It exports most of the coffee produced in Costa Rica, besides tropical fruits, rubbers, and dyewoods. Population, 4000.

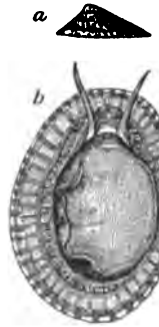
LIMONITE (from Gk. λειμών, *leimōn*, marshy, meadow), or Brown Hematite. The hydrated sesquioxide of iron ($2Fe_2O_33H_2O$), containing 59.89 per cent. of metal. When pure or nearly so, it occurs in compact masses with a silky or submetallic lustre, brown or brownish-yellow in color, and a hardness of 5-5.5 on the mineral scale; but when mixed with clay, as it often is, it is found in the form of a loose ochreous earth, colored various shades of yellow or brown. Limonite is a commercial source of iron, but by no means the most important one. Large deposits are found in Alabama and Virginia, and it is known in other States, especially those of the Appalachian region. It is mined to some extent in Europe. The ore occurs frequently in superficial deposits found by the weathering of pyritiferous and other ores, or else as nodular masses scattered through beds of ferruginous clay, and formed perhaps by deposition from waters which have circulated through and leached the adjacent rocks. A form of ore called 'bog-ore' is found in the beds of lakes, ponds, and marshes, where it has been precipitated from the water by the oxidizing action of the air. In some countries, notably Sweden, the bog-ore accumulates to a thickness of half a meter every fifteen to thirty years, and is periodically dredged out. Owing to the admixture of so much clay, limonite rarely forms a high-grade ore. The production of limonite in the United States in 1901 amounted to 3,016,715 long tons.

Bibliography. Penrose, "The Chemical Relation of Iron and Manganese in Sedimentary Rocks," *Journal of Geology*, vol. i. (Chicago, 1893); Pechin, "Virginia Oriskany Iron Ores," *Engineering and Mining Journal*, vol. liv. (New York, 1892); McCalley, "The Limonites of Alabama Geologically Considered," *Engineering and Mining Journal*, vol. lxii. (New York, 1896); Hopkins, "Limonite Ores of Pennsylvania," *Bulletin Geological Society of America*, vol. xi. (Rochester, 1900). See Iron; Bog Iron Ore; Ochre; Mineral Paints.

LIMOUSIN, lē'mōō'zăɴ'. An ancient province of France, now comprised in the departments of Haute-Vienne and Corrèze (q.v.). The land of the ancient Lemovices, it was part of the dowry of Eleanor of Aquitaine when she married Henry II. of England in 1152. In the thirteenth century it passed to Brittany, and subsequently to the House of Albret, and was united with the French Crown by Henry IV. The capital was Limoges.

LIMOUSIN, or **LIMOSIN**, lē'mō'zăɴ', Léonard (c.1505-c.1575). A French painter, enameller, and engraver, born at Limoges. He worked at Fontainebleau, and became director of the manufactory at Limoges under Francis I. His portraits in enamel are particularly celebrated, and there are some fine examples of these in the Louvre. Other members of his family, known as workers in enamel, lived in Limoges, which was famed for this especial kind of art for several centuries.

LIMPET (probably from AS. *lempedu*, variant of *lamprede*, lamprey, from ML. *lampreda*, lamprey, from Lat. *lambere*, to lick + *petra*, rock; hardly connected with Lat. *lepas*, Gk. λεπάς, limpet, from λέπας, bare rock, from λέπειν, *lepein*, to strip, to peel). A gastropod mollusk of the prosobranchiate family Patellidæ, in which the shell is nearly conical, not spiral, and with a wide mouth and the apex turned forward. The animal has a large round or oval muscular foot by which it adheres to rocks, the power of creating a vacuum being aided by a viscous secretion. Limpets live on rocky coasts, between tidemarks, and remain fixed when the tide is out, as their fringed gills cannot bear exposure to the air, but move about when the water covers them; many of them, however, it would seem, remain long on the same spot, which in soft calcareous rocks is found hollowed to their exact form. The power of adherence is very great, so that, unless surprised by sudden seizure, they are not easily removed without violence sufficient to break the shell. Curious cases of the 'homing instinct' of limpets are reported by Morgan. If removed from their station or 'home' on a rock they will find their way back, even if carried away as far as three feet. They feed on algæ. The sexes are distinct. The species are numerous and exhibit many varieties of form and color. The American species is *Acmæa testudinalis*, and



A LIMPET (*Patella*).

a, Outline of shell, in its natural position; *b*, under side, on a larger scale, showing the broad 'foot,' tentacles, and gill-fringes of the animal.

is common along the New England coast. Some of the limpets of warmer climates have very beautiful shells. A species found on the western coast of South America has a shell a foot wide which is often used as a basin. The name is often extended to other shells, especially of the related families Acmæidæ and Fissurellidæ (keyhole limpets) and the genus Crepidula (slipper limpets). The fresh-water snails of the genus Ancyclus are called 'fresh-water limpets,' from the shape of the shell. Limpet-like shells are found fossil in rocks of all ages from the Cambrian upward, and many of the early forms cannot readily be distinguished from modern genera. The oldest is Scenella, a low conic shell with reticulate surface, found in the Cambrian. Palæacmæa, with a smooth low conic shell, is from the Upper Cambrian. The genera Patella and Acmæa occur from the Silurian upward; Metoptoma, with a straighth anterior margin, is a common Silurian to Carboniferous fossil, and Tryblidium, with a thick oval flattened shell marked by strong imbricating plates, is a curious Silurian form evidently evolved from some early limpet.

LIMPKIN, or Courlan. A bird of tropical America, representing the family Aramidæ, which is intermediate in its characteristics between the rails and the cranes. Two species are known—*Aramus scolopaceus* of Eastern South America, and *Aramus pictus* of Central America, the West Indies, and southern Florida. The Spanish people of that region call it 'viuda loca,' or mad widow, on account of "its sombre plumage, solitary habits, and peculiar cry," which is heard at night in a melancholy wail. It is a bird of the swamps, flies heavily and awkwardly, and feeds on frogs, aquatic insects, etc. See Plate of Cranes, etc.

LIMPO'PO, Ubi, or Crocodile. A river in the eastern part of South Africa (Map: Orange River Colony, L 3). It rises a short distance west of Pretoria in the Transvaal Colony, and after a short course toward the northwest is joined by the Marico and forms from the point of junction the boundary line separating the Transvaal Colony from the Bechuanaland Protectorate and Southern Rhodesia. After it leaves British territory it flows in a southeastern course through Portuguese East Africa and enters the Indian Ocean through Delagoa Bay. Its total length is about 1000 miles. In its upper course it flows through an elevated region and forms a number of rapids, while the portion in Portuguese territory is chiefly through lowlands. The most important tributary is the Olifant. The Limpopo is navigable for about 250 miles from its mouth; but its mouth is obstructed by sandbars, and the river is not important for commerce.

LIMULUS. See King-Crab; Merostomata.

LINACRE, lĭn'ȧ-kẽr, or **LYNAKER**, Thomas (?1460-1524). An English humanist, physician, and divine, born at Canterbury. He studied at Oxford, and became fellow of All Souls' College in 1484. Shortly afterwards he went to Italy and devoted himself to the study of Latin, Greek, natural philosophy, and medicine under the famous teachers of the day, and translated some of Galen's treatises. Returning to England, he received the degree of D.D. and the appointment of professor of physic from Oxford University; was called to the Court by Henry VII. and made physician and tutor to Prince Arthur; was subsequently physician to Henry VII., Henry VIII., and Princess Mary. Later in life he gave up practice, took orders, and was made in 1509 rector of Mersham and prebend of Wells; in 1518 prebend and in 1519 precentor in York Cathedral. His most celebrated works are his Latin translations from Galen, among which are: *De Temperamentis* (1521); *De Tuenda Sanitate* (1517); *De Methodo Medendi* (1519). His other works are a translation of *Proclus de Sphæra; De Emendata Structura Latini Sermonis* (1524). He was buried in Saint Paul's Cathedral, where Dr. Caius erected a monument to his memory. He rendered important service in promoting the study of medicine, and was instrumental in founding the College of Physicians (1518), of which he was the first president. But his main title to remembrance rests upon scholarship and his connection with Erasmus and the other learned men who fostered classical learning in England. With Grocyn and Latimer he was among the first to teach Greek at Oxford, where Erasmus and Sir Thomas More were among his pupils. Consult his *Life* by Johnson, ed. Graves (London, 1835).

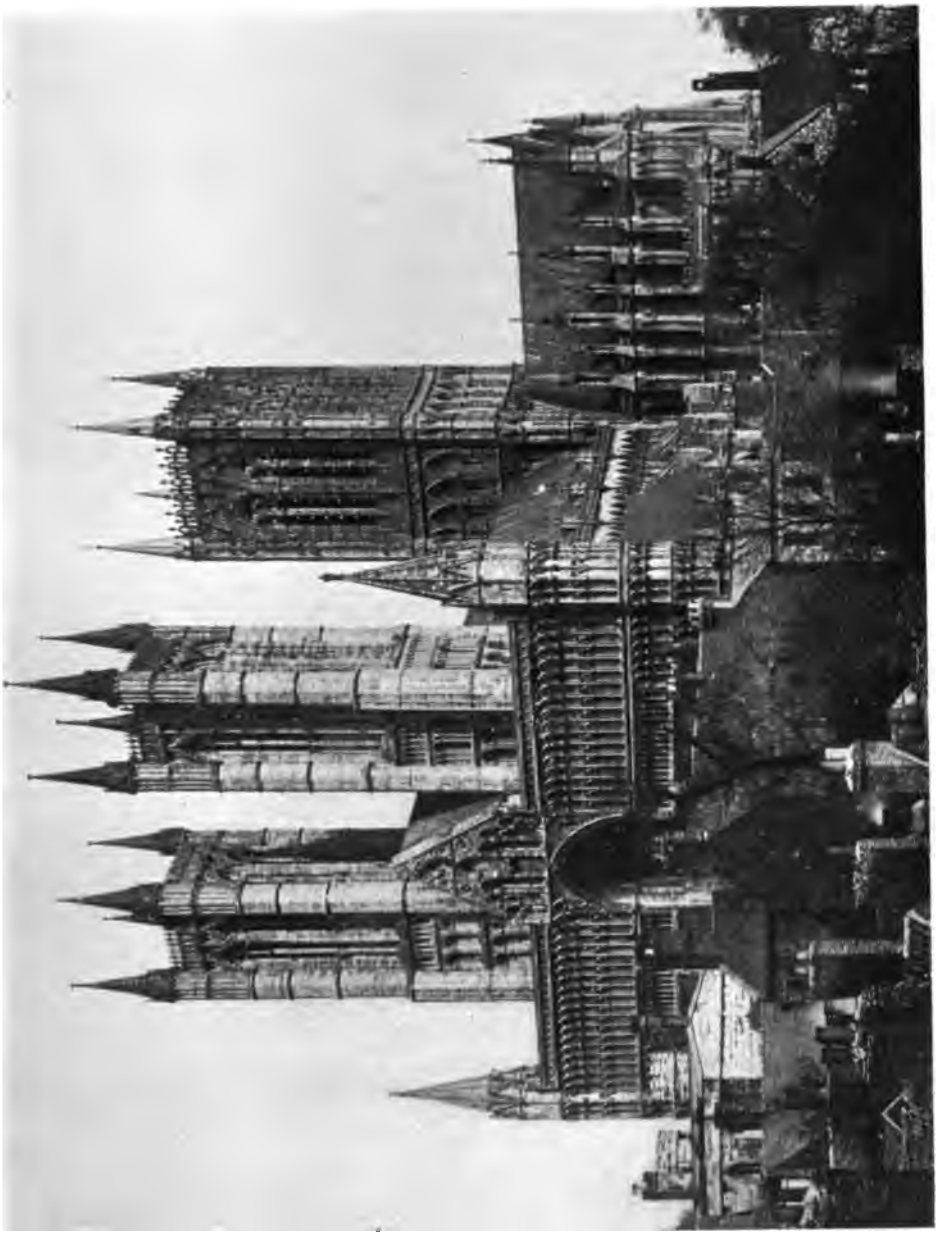
LINARES, lē-nä'rās. A province of Chile, bounded by the Province of Talca on the north, the Republic of Argentina on the east, the Province of Nuble on the south, and Maule on the west. Area, 3588 square miles. It is mountainous and well wooded, and has extensive tracts of grazing land. The chief occupations are stock-raising and viticulture. The province is traversed through the centre by the main railway line of Chile. Population, in 1895, 101,858. The capital is Linares.

LINARES. The capital of the province of the same name in Chile (Map: Chile, C 11). It is situated on a plain, 55 miles from the Pacific coast, and 85 miles northeast of Concepción. It is an important commercial centre and station on the railroad running south from Santiago. Population, 9000.

LINARES. A city of Spain, in the Province of Jaén, 24 miles north of Jaén, on a branch of the railroad between Cordova and Madrid (Map: Spain, D 3). It is an important mining town, the mines in the neighborhood producing annually 80,000 tons of argentiferous lead and copper ores. In 1891 an elaborate plant for the extraction of the metals was built here and is considered one of the best in Europe. Besides this the town has lead and iron foundries, and manufactories of powder, dynamite, and rope. Population, in 1887, 29,692; in 1900, 25,566.

LINARES, José Maria (1810-61). A Bolivian statesman, born in Potosí. He studied law, and soon after his admission to the bar began to take an active part in public life. He was appointed one of the commissioners to frame a code of laws for Bolivia. In 1839 he was made Minister of the Interior, and he was afterwards Minister to Spain. In 1848 he was president of the Senate, and in 1857 he was elected to the Presidency. Unfortunately, he was unable to carry out the policy of reform and economy for which he was elected, and he was driven from office by a revolution.

L'INCARNATION, lăN'kär'nȧ'syôN', Marie de. A French religieuse in America. See Mary of the Incarnation.



LINCOLN CATHEDRAL

LINCEI, lĕn-chā'ē, Accademia dei. A celebrated Italian learned society, founded at Rimini in 1603 by Federigo Cesi, son of the Duke of Acqua Sparta, for the purpose of fostering the study of the physical sciences. The name *lincei* or lynxes is supposed to have been adopted as an expression of the members' belief in the possibility of piercing the depths of scientific truth. Though it numbered among its members such men as Galileo and Stelluti, the society languished after 1630 and gradually died away. Restored in 1745 by Giovanni Branchi, it passed once more out of existence. It was revived for a second time toward the end of the eighteenth century, but was of little real importance till the occupation of Rome by the Italian troops in 1870, when it became what it has remained to the present day, one of the principal associations in Italy for the advancement of science and scholarship. As reorganized in 1870, it is divided into a royal and a Papal section.

LINCOLN, lĭn̄'kon. The capital of Lincolnshire, England, a civic county, Parliamentary and municipal borough, and episcopal see, on the Witham, 130 miles northwest of London (Map: England, F 3). It is a junction of six railroads and has extensive canal communications.

Built on the slope of a hill, which is crowned by the cathedral, the city is imposing. It is irregularly laid out, and contains many interesting specimens of early architecture, such as the Roman Gate, the remains of the Norman castle and of the palace and stables of John of Gaunt, and the town hall. The cathedral, one of the finest in England, is the principal building. It is surmounted by three towers, two of which, 180 feet in height, were formerly continued by spires of 101 feet. The central tower, 53 feet square, is 300 feet high. The interior length of the cathedral is 482 feet, the width 80 feet. The famous bell called Tom of Lincoln, cast in 1610 and recast in 1834, hangs in the central tower; it is 5 tons 8 cwt. in weight. The style of the cathedral is chiefly early English. Lincoln has numerous schools and benevolent institutions. Its municipal administration is noteworthy. It owns remunerative real estate markets, a racecourse, water-works, and gas and electric lighting plants, and maintains a free library, technical instruction, an arboretum, recreation grounds, public baths, and a sewage farm. One member is returned to the House of Commons for the city. Several iron-foundries and manufactories of portable steam-engines and agricultural machines, as well as large steam flour-mills, are in operation here, and there is an active trade in corn and wool. Lincoln is an important live-stock market, and horse and cattle fairs are annually held. It is also an important horse-racing centre. The town was called by the Romans *Lindum*, which, with *Colonia*, gives the modern name. Lincoln under the Romans was a place of some importance, and also under the Saxons and Danes. It was the seat of an extensive shipping trade at the time of the Norman Conquest, the river at that time being navigable for large vessels. Population, in 1861, 20,999; in 1881, 37,312; in 1901, 48,784. Consult: Allen, *History of Lincoln* (London, 1833); Kendrick, *Lincoln Cathedral* (London, 1898).

LINCOLN. A city and the county-seat of Logan County, Ill., 29 miles northeast of Springfield; on the Chicago and Alton, the Illinois Central, and the Peoria, Decatur and Evansville railroads (Map: Illinois, C 3). It is the seat of Lincoln University (Cumberland Presbyterian), opened in 1865, and of the State Institution for Feeble-Minded Children, and has a public library, for which a building has been given by Andrew Carnegie, Odd Fellows' Orphans' Home, Saint Clara's Hospital, and Deaconess Home and Hospital. In the old court-house Abraham Lincoln practiced as a lawyer. The surrounding region possesses vast deposits of coal; and among the industrial plants of the city are coal-mines, flouring-mills, and horse-collar, mattress, casket, excelsior, and cellulose factories. Settled in 1835, Lincoln was incorporated in 1854. Its present government is administered under a charter of 1865 which provides for a unicameral council and a mayor, biennially elected. Population, in 1890, 6725; in 1900, 8962.

LINCOLN. The second city of Nebraska, State capital and the county-seat of Lancaster County, 55 miles southwest of Omaha; on the Burlington Route, the Chicago, Rock Island and Pacific, the Fremont, Elkhorn and Missouri Valley, the Union Pacific, and the Missouri Pacific railroads (Map: Nebraska, H 3). The attractive city, with its fine wide avenues and modern business blocks and homes, lies spread out on a level prairie. It is the seat of the University of Nebraska (q.v.), Nebraska Wesleyan University (Methodist Episcopal), Cotner University (Christian), Union College (Adventist). The State Asylum for the Insane and the State penitentiary are located here. The noteworthy buildings include, besides those already indicated, the State Capitol, built of white limestone at a cost of $500,000, United States Government buildings, county court-house, Saint Elizabeth's Hospital and Home for the Friendless, and the new public library, costing $75,000, the gift of Andrew Carnegie. In addition to the city library, there are the State, State Historical, and State University libraries.

The central position of the city and its railroad facilities make it an important distributing point for the agricultural and mechanical productions of a large area. It has valuable quarries of limestone in the vicinity and deposits of excellent clay. There are numerous grain elevators, the city being the centre of an important grain trade, and manufactories of upholstered goods, mattresses, brooms, dusters, overalls and shirts, flour, bricks, creamery products, etc. The government is vested in a mayor, elected every two years, a unicameral municipal council, and administrative officials, many of whom are appointed by the executive with the consent of the council. The city clerk, treasurer, city attorney, city engineer, water commissioner, and police judge are chosen by popular election, and the library board is elected by the council. The water-works are owned and operated by the municipality. Lincoln spends annually in maintenance and operation about $350,000, the main items being $120,000 for schools, $25,000 for the water-works, $25,000 for the fire department, and $15,000 each for the police department and for municipal lighting. Population, in 1870, 2441; in 1880, 13,003; in 1890, 55,154; in 1900, 40,169.

In 1859 the site of Lincoln was chosen for the location of a city to be called Lancaster, but there were hardly a dozen settlers there in 1864, when the place was laid out. Three years later, the inhabitants then numbering less than 30, Lancaster was chosen as the capital of Nebraska, and its name changed to Lincoln in honor of Abraham Lincoln. Consult Hayes and Cox, *History of the City of Lincoln* (Lincoln, Neb., 1889).

LINCOLN. A city and the county-seat of Lincoln County, Kan., about 150 miles west of Topeka; on the Saline River, and on the Union Pacific Railroad. It has fine school and county buildings, and is the seat of the Kansas Christian College, opened in 1882. The city carries on a considerable trade in grain, produce, live stock, etc., and there are grain-elevators and flour-mills, and extensive quarries of fine limestone. Population, in 1890, 1100; in 1900, 1262.

LINCOLN, Abraham (1809-65). The sixteenth President of the United States, born in Hardin County, Ky., February 12, 1809. His ancestry has been with some difficulty traced back to Samuel Lincoln, of Norwich, England, who emigrated to America and settled in Hingham, Mass., in 1638. Some of his descendants, who were Quakers, settled in Amity Township, N. J., and finally in Rockingham County, Va. The Virginia Lincolns are described as "reputable and well-to-do." One of them, the President's grandfather, removed to Jefferson County, Ky. Thomas Lincoln, Abraham's father, a carpenter by trade, was ignorant and thriftless. He married Nancy Hanks, who seems to have belonged to an obscure family, but herself to have been a woman of noble character. After several removals in Kentucky, Thomas Lincoln went in 1816 to Indiana. At the new home his wife died after two years, when Abraham was not quite eight years old, and a year later he married Mrs. Sally (Bush) Johnson, whom he had formerly courted. All Abraham's schooling combined would probably not have made up more than one year. As he grew up, however, he had access to a few books which he read and reread—the Bible, Shakespeare, Æsop's *Fables*, *Robinson Crusoe*, *Pilgrim's Progress*, a history of the United States, and Weems's *Washington*. He seems to have been ambitious from the outset, trying hard to learn, but much influenced by the coarseness of his surroundings, from the externals of which he never got quite free. He grew to be six feet four inches in height; marvelous tales are told of his strength, and much more credible ones of his laziness, skill at jesting and story-telling, and popularity.

When Abraham was twenty-one his father's migratory nature impelled him to try his fortunes in Illinois, and he settled on the north fork of the Sangamon, which empties into the Illinois. Here the younger Lincoln helped to split rails and to clear and plant some fifteen acres. In 1831, with two relatives, he took a flatboat to New Orleans, whither he had made a previous trip. Ten years later he went to New Orleans again. These trips enabled him to see the true nature of slavery. In 1832 Lincoln was chosen captain of a company of volunteers for service in the Black Hawk War. They saw no fighting and were mustered out within five weeks, when Lincoln reënlisted as a private, serving until June 16th. He then returned to Sangamon, making his abode at the little mushroom town of New Salem, and, having announced his candidacy for the State Legislature, he began electioneering vigorously. With great humor and with an energy not always confining itself to strict argument, he advocated pure Whig doctrine—a national bank, internal improvements, and a protective tariff. The follower of Clay was beaten by the Jacksonian Democrats, but he had gained experience and had spread his popularity. His next venture was as a partner in a dry-goods and grocery store at New Salem, but the concern failed, the partner fled, and Lincoln was left to settle the losses. He paid all he owed in 1849. Having no gift for trade, he now began to read law, studied hard, and made swift headway. In May, 1833, he was appointed postmaster at New Salem, and is said to "have carried the post-office in his hat," for the mail came but once a week. This position he held three years. In 1834 Lincoln's personal property was about to be sold by the sheriff to satisfy a judgment, when a new friend, Bolin Greene, bid in the property and gave it over to him. In 1834 he was again a candidate for the Legislature, and was elected, running far ahead of his ticket. He was rather an observer than an active legislator in this session.

Lincoln's first love was unhappy. While boarding with James Rutledge, in New Salem, he became enamored of Ann, his landlord's daughter, a well-reared girl of seventeen. She had at the time another lover, who promised marriage, but he broke his word. Lincoln and Ann Rutledge were betrothed in 1835, but the girl fell ill, and in August she died of brain fever.

In 1836 Lincoln was again a candidate for the Legislature on the following characteristic platform: "I go for all sharing the privilege of the Government who assist in bearing its burdens. Consequently, I go for admitting all whites to the rights of suffrage who pay taxes or bear arms, by no means excluding females." Lincoln stumped the district, and by his vigorous speeches won a Whig victory. In the Presidential contest of 1836 Lincoln was for Hugh L. White of Tennessee. In the struggle of Jackson against the United States Bank and the shifting policy of Van Buren he had no interest, but he heeded his duties as a legislator, and began that anti-slavery record upon which so much of his fame will ever rest. The abolitionists were in the highest activity. Garrison's *Liberator* was intensely annoying to the upholders of slavery. President Jackson had at the close of 1835 invited the attention of Congress to the circulation through the mails of what were then called 'inflammatory' documents. Henry Clay, Edward Everett, many of the Governors of the Northern States, and a large majority of the House of Representatives strenuously opposed the agitation of the slavery question; all petitions to Congress on the subject were laid on the table without reading or debate, and all possible means were taken to prevent the discussion of the hateful subject. On the night of November 7, 1837, the Rev. Elijah P. Lovejoy was mobbed and shot dead at Alton, Ill., for persisting in publishing an abolition newspaper.

At this juncture, when the Legislature was about to pass resolutions deprecating the anti-slavery agitation, Lincoln presented his protest, to which he could get but one signer besides himself. Herein he declares slavery to be founded on injustice and bad policy; but he avers that abolition agitation tends to increase slavery's

ABRAHAM LINCOLN

AFTER THE PORTRAIT BY WILLIAM MARSHALL

evils; that Congress may not interfere with slavery in the States, though it might in the District of Columbia on the request of the people. This protest was meant to avoid extreme views; therefore no mention was made of slavery in the Territories, that point being covered by the Missouri Compromise, which was then in full force. Lincoln was never extreme, and probably till the war began he saw no hour when he would have altered a word in this protest.

When the State capital was removed to Springfield in 1839, Lincoln settled there. Two years before he had been licensed as an attorney, and being at the capital, he could attend both to his duties as a member of the Legislature and his law practice. His business grew so rapidly that he took into partnership John T. Stuart, a prominent Whig, who had been a good friend also in former years. Lincoln preferred to be the junior in the firm. Springfield was a village of about 1500 inhabitants, and Lincoln was not only poor, but he was in debt.

In 1840 Lincoln was an elector on the Harrison ticket, and made speeches in all parts of the State. But one-sided speeches were not suited to his temper; he preferred joint debates, wherein he might employ his masterly skill at retort. A year earlier Lincoln had made the acquaintance of Mary, the daughter of the Hon. Robert S. Todd, of Lexington, Ky., and a sister of the wife of Ninian W. Edwards, of Springfield, a distinguished lawyer. Through her comeliness and her wit the young lady had gained many admirers. Some political papers were contributed by her to a local newspaper; and Lincoln, to shield her, assumed the responsibility, barely avoiding a duel. About six weeks afterwards, November 4, 1842, he married Miss Todd.

In 1844 Lincoln was once more an elector on the Clay (Whig) ticket, and in 1846 he was elected to Congress by 1511 majority in a district which two years before had given him only 914. When he took his seat as Representative in the Thirtieth Congress, his great rival, Stephen A. Douglas, was in the Senate. Lincoln was put on the Committee of Post-Offices and Post-Roads. Though opposed to the Mexican War, he voted for supplies to carry it on. In 1848 he favored the nomination, by the Whigs, of Taylor for President, and made a strong speech in the House for that purpose, subsequently speaking in various parts of the country. In the second session of the Thirtieth Congress he made no special mark. His law partnership with Stuart ended April, 1841, when he united in practice with ex-Judge Stephen T. Logan, and soon afterwards formed a partnership with his best friend, William H. Herndon. As a lawyer he spoke tellingly and often to the mirth of the courtroom. Many curious anecdotes are told of the great man as a story-teller, of his power, his energy, his oddities, and his generosity. Though thousands of good stories unknown to Lincoln pass current as having been told by him, it is true that few great statesmen were more capable than he of perceiving the kernel of a tale. He had also a ready and humorous wit, and was quick to follow a good parry with a well-aimed thrust.

When his term in Congress was over Lincoln wished to be Commissioner of the General Land Office, but he did not get the appointment. He was offered the Governorship of Oregon Territory, but his wife declined to go there, and he would not accept. For two years after leaving Congress he was not prominent. In 1850 he refused a nomination for Congress. July 1, 1852, he was selected at a meeting of citizens to deliver a eulogy on Henry Clay. The bill offered by Douglas, January 4, 1854, to establish a Territorial Government in Nebraska, reopened the anti-slavery war, and Lincoln was forced to take decided ground against spreading slavery into the Territories. This he did at the State Fair at Springfield, Ill., in October, in a speech of great power. Lincoln had felt that his natural opponent was Douglas and he seized eagerly this opportunity of refuting his arguments; Douglas recognized his opponent's strength and secured from him a truce from debating for that fall. In November, despite his positive declination, Lincoln was again elected to the Legislature. At the same time he was very desirous to succeed Shields (a Democrat) in the United States Senate; but Lyman Trumbull carried off the prize. During the Kansas excitement Lincoln's sympathies were all in favor of the free-State side, but he discountenanced the use of force.

It was at the State Convention at Bloomington in 1856 that the Republican party in Illinois was formed, and there Lincoln made what many deem the greatest of all his speeches. This speech, preserved only in description, took advanced anti-slavery ground and was undoubtedly earnest and powerful. On June 17, 1856, at the Republican Nominating Convention at Philadelphia, Lincoln's name was put forth for Vice-President, and was received with considerable favor, for he got 110 votes. This year, for the third time, Lincoln was on the electoral ticket, now as a Republican, and he made some fifty speeches for Frémont. The quality of these speeches bettered his reputation and spread it even to the East. In April, 1858, the Democrats indorsed the stand Douglas had taken in the Kansas dispute, and nominated him for the Senate. Lincoln expected and received the Republican nomination in June, and in accepting he delivered the carefully thought out speech which contained the famous statement that a house divided against itself cannot stand. In July he challenged Douglas to the now famous seven debates, the direct result of which was to win the latter the Senatorship. Lincoln, however, was not arguing for the Senatorial prize alone, but with a greater purpose—he was fighting for Republican success in the Presidential contest of 1860, and the opportunity it would bring to 'hit hard' the great 'moral, social, and political wrong' of slavery.

In April, 1859, the people of his own town began to talk of Lincoln as a proper candidate for President, but he discouraged the idea. In September he made speeches in Ohio in the track of Douglas; in December he spoke at several places in Kansas. He was more and more talked of for a Presidential nomination, and finally authorized his friends to work for him. On February 27, 1860, on invitation, he appeared in New York and spoke in Cooper Institute. The address was warmly praised in most of the city journals, and was in fact highly successful. After this he spoke in many cities in New England. He was present, though not a delegate, at the Illinois State Convention, May 9, 1860, where he received the most flattering evidences of his great popularity, which was fully assured by the adoption without dissent of a resolution declaring him the choice of the Republicans of Illinois for President.

On May 16, 1860, the Republican National Convention met at Chicago. The city was full of political workers. Indeed, no previous convention had had half the number of 'outside delegates.' Two days were spent in organization and the adoption of a platform. Balloting came on the third day. Up to the previous evening Seward's nomination seemed certain; but the outside pressure for Lincoln was powerful, for his friends were chiefly men of Illinois, and the convention was held in their State. On the third ballot Lincoln won the nomination, and in the afternoon Hannibal Hamlin, of Maine, was nominated for Vice-President. The platform adopted, though denying the right of Congress to interfere with slavery in the States, demanded that slavery be forbidden in the Territories. It declared in favor of internal improvements and protection.

The Democratic National Convention at Charleston split on the slavery question. The South totally repudiated Douglas and his squatter sovereignty, whereas Douglas was equally determined to stick to it. Most of the Southern delegates withdrew and organized a separate convention. Those who remained voted fifty-seven times for a candidate, Douglas always having the highest number, but not the two-thirds required by Democratic precedent. They adjourned to meet at Baltimore, June 18th. The seceders adjourned to meet at Richmond, Va., early in June, but after convening they further adjourned to meet June 28th in Baltimore. The result finally was the nomination of three Presidential candidates: Douglas by one convention, Breckenridge of Kentucky by the seceders, or extreme Southerners, and Bell (formerly a Whig) of Tennessee, by the 'Constitutional Union' Party, composed for the most part of 'Know-Nothings' and old-time Whigs. The canvass was warm on all sides. Lincoln was elected on November 6th by 180 votes, Breckenridge receiving 72, Bell 39, and Douglas 12. The election was strictly sectional, for the Republicans got no electoral vote in a Southern State. Feeling the need of all possible support, Lincoln chose his Cabinet carefully, trying to get a varied representation; he wished even to have a Southerner, until his offer to Mr. Graham, of North Carolina, was flatly refused. Meanwhile the South was making ready to secede, and on December 20th the South Carolina Convention unanimously adopted the ordinance of secession. The year closed in gloom, and 1861 opened with no hope of peace. On February 4th a peace congress met in Philadelphia; on the same day delegates met at Montgomery, Ala., to form a Southern Confederacy; on the 18th the work was done, and Jefferson Davis was inaugurated President.

On February 11, 1861, Lincoln set out for Washington, taking a rather roundabout road. Everywhere the people were eager to see and hear him. On Monday, March 4th, he was inaugurated, and delivered an elaborate address, full of the best qualities of his nature. The appearance of the new President is thus described by Ward Lamon, in his *Life of Abraham Lincoln:* "He was six feet four inches high, the length of his legs being out of all proportion to that of his body. When he sat on a chair he seemed no taller than an average man, measuring from the chair to the crown of his head; but his knees rose high in front. He weighed about 180 pounds, but was thin through the breast, narrow across the shoulders, and had the general appearance of a consumptive subject. Standing up, he stooped slightly forward; sitting down, he usually crossed his long legs or threw them over the arms of the chair. His head was long and tall from the base of the brain and the eyebrow; his forehead high and narrow, inclining backward as it rose. His ears were large and stood out; eyebrows heavy, jutting forward over small sunken blue eyes; nose long, large, and blunt; chin projecting far and sharp, curved upward to meet a thick lower lip, which hung downward; cheeks flabby, the loose skin falling in folds; a mole on one cheek, and an uncommonly prominent Adam's apple in his throat. His hair was dark brown, stiff and unkempt; complexion dark, skin yellow, shriveled, and leathery. Every feature of the man—the hollow eyes, with the dark rings beneath, the long, sallow, cadaverous face, intersected by those peculiar deep lines, his whole air, his walk, his long and silent reveries, broken at intervals by sudden and startling exclamations, as if to confound an observer who might suspect the nature of his thoughts—showed that he was a man of sorrows, sorrows not of to-day or yesterday, but long-treasured and deep, bearing with him continual sense of weariness and pain." Yet this strangely sorrowful man dearly loved jokes, puns, and comical stories, and was himself world-famous for his inimitable narrative powers. He drank very little, and was in precept and example for temperance; and at table he always ate sparingly. He was never a member of a church; indeed, he is believed to have had doubts of the divinity of Christ and of the inspiration of the Scripture, i.e. of revelation. In early life he read Volney and Paine, and wrote an essay in which he agreed with their conclusions. Of modern thinkers he was thought to agree most with Theodore Parker.

At his inauguration Lincoln denied the right of any State or number of States to go out of the Union. In the South the address was regarded as practically a declaration of war, and preparations were hurried; in the North it was strongly approved, and parties were quickly consolidated. Less than six weeks afterwards, General Beauregard, on behalf of the Confederate Government, bombarded Fort Sumter, in Charleston Harbor, forcing the surrender of Major Anderson and his small force on April 14th. There began the Civil War, and from that day to the day of his death the political biography of Lincoln is nearly identical with the history of the United States. On April 15th he called for 75,000 volunteers, and hundreds of thousands in the first flush of patriotic feeling thronged to enlist. At the same time Lincoln called for a special session of Congress to meet on the Fourth of July. On April 19th he proclaimed a blockade of the Southern ports; on April 27th he authorized the suspension of the writ of *habeas corpus.* The date for the meeting of Congress had been made distant, not only to allow the President to develop his policy and to avoid the turmoil that would ensue if the members met in the height of passion, but also to take advantage of the famous holiday—thus satisfying a curious superstitious streak in Lincoln's nature. The only direct request made was for 400,000 men and $400,000,000. The request was granted with additions. On July 15th a Democratic member (McClernand of Illinois) offered a resolution pledging the House to vote any amount of money and any number of men necessary to put down the rebellion and restore the authority of the Government. There were only five opposing votes in a House of nearly 300 members.

On July 21st the Union forces were badly defeated at Bull Run, and driven in a panic back upon Washington. For a moment this flight had the effect of disheartening the President. General Scott, who was commander-in-chief when the war broke out, resigned at the end of October, 1861, and Gen. George B. McClellan took his place. McClellan was a skillful tactician and organizer, but slow to strike. Lincoln realized the necessity for acting, but he had not yet gained the knowledge of war that he later acquired. His appointment of Edwin M. Stanton, a man not pleasing to him personally, as Secretary of War (January 14, 1862), was an evidence of great statesmanship, and Lincoln had trials that would have broken a weaker man. McClellan, after waiting and complaining unnecessarily, finally began a campaign in which he was thoroughly baffled by General Lee. In July Halleck was appointed general-in-chief of the armies of the United States. At the end of August the principal Federal force, under the command of Pope, was defeated in the second battle of Bull Run. On September 16th-17th McClellan met Lee in the bloody battle of Antietam in Maryland. This engagement was hardly decisive, but as the Confederates were forced to give up their invasion, Lincoln chose this moment to issue his proclamation, September 22, 1862, declaring that he would on January 1, 1863, emancipate the slaves of all the States then or thereafter in rebellion. This proclamation was a military measure justified as depriving the South to some extent of an advantage it enjoyed. Politically it was of the utmost importance, since it was the means of winning from the anti-slavery element throughout the North a more hearty support than had previously been accorded, and added greatly to the influence of the National Government abroad, where economic hardships threatened to conceal the fact that the war was being fought largely to vindicate a great moral principle. The support it received finally showed Lincoln to be right. Before this, though desiring emancipation, he had labored to persuade the border States to take the step of their own accord, in return for compensation, but he had been unsuccessful. Two years afterwards Lincoln said of the proclamation: "As affairs have turned it is the central act of my administration, and the great event of the nineteenth century." McClellan failed to use his great force to follow Lee after Antietam; Burnside took command and was defeated at Fredericksburg; Hooker was appointed and suffered the disaster of Chancellorsville. Then the tide began to turn, and on July 4th, 1863, General Grant captured Vicksburg. At the same time Meade at Gettysburg beat off the second invasion of Lee and won a decisive victory. On November 19, 1863, Lincoln made his immortal speech on the dedication of the National Cemetery at Gettysburg. Meade having failed to follow up his victory over Lee, Lincoln, in March, 1864, complying with the recommendation of Congress, appointed Grant commander-in-chief. The South was nearly worn out and Lee's superior generalship could not prevail against Grant's determination and unlimited resources. On April 9, 1865, Lee surrendered at Appomattox.

On November 8, 1864, Lincoln was reëlected over General McClellan by a vote of 212 to 21; Andrew Johnson was elected Vice-President. When Lee's surrender ended the war Lincoln was busy with plans for reconstruction, but on April 14, 1865, before he could do anything toward utilizing his wisdom in reorganization, he was shot in his box at Ford's Theatre by John Wilkes Booth, a dissipated and fanatical actor. The ball entered Lincoln's brain and he never regained consciousness. At 7 o'clock on the following morning he was dead.

The loss to the country by this death was incalculable, and the assassin injured most of all the people he would have served. The problem of bringing the two sections again into a union which should be more than one of force was as difficult as that of managing the war. To this problem Lincoln would have brought not only his experience, but generosity, utter lack of vindictiveness, incomparable tact, a tried strength which prevented vacillation. Lincoln's most marked characteristic was the accuracy with which he understood the American people. He was wholly honest; he thought fairly and never as a bigoted partisan. As a lawyer he was weak unless convinced of inherent right in his case, and when he was convinced he relied for victory on a skill in presenting facts which often set the other side in a light clearer than their attorneys could throw on their case. He conquered by the power of truth. This love for truth, his infinite patience, and his hard thinking seem to have guided him unerringly in every great problem he had to solve. He who had grown up in a drifting, almost illiterate, shiftless society, who had no education save that which he had been able to pick up in hours not devoted to bread-getting, who had been for years a mere country lawyer, with a narrow horizon, directed a foreign policy of dignity, strength, and honesty. Lincoln came of rough, shiftless, poverty-stricken stock, but through inexplicable gifts he wielded in a democracy and with the full consent of the people a power as great as that of the Czar. It was altogether fitting that a man of such charity should have the honor of doing most to free his country of slavery. This was his great achievement, but it must not be forgotten that events so great as the inception of the Pacific railroads and of the present national banking system belong to his administration. Some of the measures taken to repress Northern sympathizers with the South brought upon him harsh criticism, but these will probably be condoned by history, or at most condemned very tenderly. For the memory of the great martyr President is year by year held in more honor throughout the entire Union for which he gave his life.

Consult: *Lives* by Holland (Springfield, Mass., 1865); Lamon (Boston, 1872); Leland (New York, 1879); Arnold (Chicago, 1885); by Herndon and Weik (3 vols., ib., 1889); by Nicolay and Hay (10 vols., New York, 1890); and an abridgment by Nicolay in 1902; *Reminiscences* by distinguished men of his time (New York, 1885); Morse in the "American Statesmen Series" (Boston, 1893); Hapgood (New York, 1899); and Tarbell (New York, 1900).

LINCOLN, BENJAMIN (1733-1810). An American soldier, prominent in the Revolutionary War. He was born at Hingham, Mass., January 24, 1733, received a common-school education, and was engaged in farming at Hingham until 1774, acting successively as local magistrate, Representative in the Massachusetts Legislature, and colonel of militia. In 1775 he took an active part in organizing the Continental forces, and in 1776 was appointed major-general of the Massachusetts militia. At the siege of Boston, Washington put him in command of an expedition to force the British fleet out of Boston Harbor. He commanded the Massachusetts militia at the battle of White Plains; reinforced Washington by a fresh levy of Massachusetts militia at Morristown, N. J., in February, 1777; and at Washington's request was made a major-general in the Continental Army, on February 19th of that year. He served with marked efficiency in the Burgoyne campaign, both under Schuyler and Gates, being second in command under the latter; and on October 8, 1777, received a wound which maimed him for life, and caused his temporary withdrawal from the army. Resuming service in August, 1778, he was assigned to the command of the Southern Army in September, and arrived at Charleston, December 4th. A detachment of his army was defeated at Brier Creek (q.v.) in March, 1779, and his main force met with a severe repulse at Stono Ferry in June. Later he acted in conjunction with the French under D'Estaing against Savannah, but, the combined forces meeting with a sanguinary repulse on October 9th, he returned to Charleston, where he was soon besieged by the English under Sir Henry Clinton and was forced to surrender May 12, 1780, after which he returned to Hingham, Mass., on parole. Exchanged in the spring of 1781, he joined Washington and was chosen by him at Yorktown to receive the sword of Lord Cornwallis. He held the office of Secretary of War in 1781-1783, and retired to his farm at Hingham in 1784. In 1786-87 he commanded the Massachusetts militia against Shays and his followers (see SHAYS'S REBELLION), and in 1789 was made Collector of the Port of Boston, which position he held until two years before his death. Late in life he took a great interest in science, and wrote a number of scientific papers which attracted considerable attention. He was a man of simple, earnest character; and the persevering zeal and disinterestedness of his public service gave him great popularity. Consult the biography by Bowen in Sparks, *Library of American Biography*, series 2, vol. xiii. (Boston, 1847).

LINCOLN, JOHN LARKIN (1817-91). An American educator. He graduated at Brown in 1836, was tutor there (1838-41), and was professor of Latin from 1844 until his death. He was the editor of *Selections from Livy* (1847); the *Works of Horace* (1851); *Ovid, with Notes* (1883); and the *De Senectute* (1887).

LINCOLN, LEVI (1749-1820). An American political leader, born in Hingham, Mass. He graduated at Harvard in 1772; was active in the patriot cause, and wrote the *Farmer's Letters;* was made clerk of the court in Worcester County in 1775; and later became probate judge. In 1796 he became a member of the State House of Representatives, and in 1797 of the State Senate; in 1800 he was elected to Congress; in 1801 became Attorney-General in Jefferson's Cabinet, and in the same year was for some months acting Secretary of State. He was Lieutenant-Governor of Massachusetts in 1807-08; was Governor from December, 1808, until May, 1809; and in 1811 declined an appointment as Associate Justice of the United States Supreme Court, on account of failing eyesight.

LINCOLN, LEVI (1782-1868). An American politician, born in Worcester, Mass. He graduated at Harvard in 1802, entered the legal profession in 1805, served in the State Constitutional Convention of 1820, and was often a member of the Legislature, serving as Speaker of the House in 1822, and president of the Senate in 1845. He was elected Lieutenant-Governor of Massachusetts in 1823, was also a judge of the State Supreme Court in 1824, and was Governor from 1825 to 1834. From 1835 to 1841 he was a member of Congress, and in 1848 became the first Mayor of Worcester.

LINCOLN, ROBERT TODD (1843—). An American politician, son of Abraham Lincoln, born at Springfield, Ill. He graduated at Harvard in 1864, and then entered the Federal Army as a captain on General Grant's staff. At the close of the Civil War he settled in Chicago, and practiced law until 1881, when he entered Garfield's Cabinet as Secretary of War. He was retained in this position by President Arthur, and in 1884 was mentioned for the Presidential candidacy, but refused to oppose Arthur in the convention. From 1889 to 1893 he was Minister of the United States to Great Britain. He was counsel for the Pullman Palace Car Company, and after the death of George M. Pullman became its president.

LINCOLN COLLEGE. A college of Oxford University. It was founded in 1427, under the name of the College of Saint Mary and All Saints, by Richard Fleming, Bishop of Lincoln, and a former Wiclifite, for a rector and seven fellows, for the benefit of his diocese and the fighting of the Wiclifite heresy. The college was endowed in part by the impropriating of the neighboring parish church. Fleming died shortly after the college was founded, and his work was carried on by John Frost, Dean of Wells, who finished the buildings and added others. The foundation was completed by Thomas Rotherham, Bishop of Lincoln, later Archbishop of York and Lord High Chancellor, who reorganized the college under new statutes in 1479-80. By these works he earned the title of second founder. The fellows were originally masters or bachelors of arts, and their election limited to the dioceses of York, Lincoln, and Wells. In 1855 new statutes provided for a rector, 12 fellows, and 14 scholars, and the fellowships were thrown open. The present establishment consisted, in 1902, of a rector, 10 fellows, 13 scholars, 13 exhibitioners, 2 lecturers, college officers, and about 100 undergraduates in all. The patronage consists of nine benefices. Of the buildings, the Hall, built in 1437, the chapel, 1631, and the kitchen, a very ancient building, are the most interesting. Among the more distinguished members of the college may be mentioned John Wesley (fellow), Lord Crewe, Bishop Williams of Lincoln, Sir William

Davenant, the poet Robert Montgomery, Mark Pattison, John Morley, and James Cotter Morison.

LINCOLN GREEN. A color associated with the cloths for which Lincoln, England, was once famous.

LINCOLN MONUMENT. A monument in the Oak Ridge Cemetery of Springfield, Ill., marking the burial-place of Abraham Lincoln. It was erected in 1874 at a cost of over $200,000, and consists of a granite structure of imposing dimensions, surmounted at a height of 120 feet by a bronze statue of the martyr President.

LIN'COLNSHIRE. A maritime county of England, the second largest in the country, bounded north by Yorkshire, east by the North Sea (Map: England, F 3). Area, 2638 square miles. The surface generally is flat, a large part protected by embankments lying below the level of the sea, and forming part of the Bedford Level (q.v.). The county is divided into three districts: Lindsey on the northeast, on which are the Lincoln Wolds or Chalk Hills, Kesteven on the west, and Holland on the south. The chief rivers are the Trent, Witham, Welland, and the Humber, which separates the county from Yorkshire on the north. The soil is fertile, and agriculture is in an advanced state; stock-raising is a thriving industry, and there are important fisheries. Capital, Lincoln. Population, in 1891, 472,878; in 1901, 498,780.

LINCOLN'S INN. One of the four great guilds or societies of lawyers in England, known as inns of court, which enjoy the exclusive power of calling persons to the bar. It derives its name from the fact that the group of buildings in London occupied by it belonged to the Earl of Lincoln in the reign of Edward II. It became an inn of court soon after his death in 1310. See INNS OF COURT.

LINCOLN'S INN FIELDS. A great square in London near the Courts of Justice, laid out by Inigo Jones, and named from Lincoln's Inn, which stands on the east side of the square. The Royal College of Surgeons faces the square on the south and the Sloane Museum on the north. The place was formerly notorious as a resort of beggars and thieves, and was the scene of a number of executions for political offenses.

LINCOLN UNIVERSITY. See JAMES MILLIKEN UNIVERSITY.

LINCRUS'TA-WAL'TON (Neo-Lat., from Lat. *linum*, flax + *crusta*, crust, hard surface). An embossed wall-covering, designed as a substitute for wall-papers, natural woods, or plaster modeling. It was named for its inventor, Frederick Walton. The material consists of linseed oil with which is mixed wood-fibre, cork, cellulose, paper, or other thickening substance. The mixture after being treated chemically is made into sheets, which are then backed with light canvas and stamped in an ornamental pattern. It is waterproof, warm, and washable. The original color is light brown or gray, but when mounted on the wall it may be painted, bronzed, or gilt. The figures may be stamped in high relief with striking effect. Lincrustra is really a variety of linoleum (q.v.).

LIND, JENNY (Madame GOLDSCHMIDT) (1820-87). A celebrated singer, popularly known as 'the Swedish Nightingale.' She was born at Stockholm of humble parentage. Her wonderful voice was first noticed by an actress, through whose influence she was afterwards admitted, at the age of nine, into the Stockholm Conservatory of Music, at which place she became the pupil of Crœlius and Berg. Through the school of singing attached to the Court theatre, she was enabled to make her début (1838) as Agathe, in *Der Freischütz*, in which her success was instantaneous. In 1841 she passed a period of nine months in study with Manuel Garcia in Paris. In Berlin (1844), where she had gone to study German, she sang the rôle of Vielka in Meyerbeer's *Feldlager in Schlesien*. In April, 1845, she made an extensive tour throughout Continental Europe, during which she met with unequaled success, her singing at the Leipzig Gewandhaus firmly establishing her reputation, and securing for her an engagement for the Vienna Opera. Her first appearance in England was in 1847. From 1850 to 1852 she made a tour of the United States, which was as successful from the financial point of view as it was from the artistic. She was married in Boston in 1852 to Otto Goldschmidt, who was conducting the Bach Choir. After her return to Europe she lived for a few years at Dresden, and afterwards settled in London. Her last public appearance was at Düsseldorf at the festival of the Lower Rhenish Musical Society in 1870. Possibly no other stage artist has been as popular throughout the world for her personal qualities as Jenny Lind. She was widely known for her generosity. Her voice was a soprano of bright, brilliant, thrilling, and sympathetic quality, her principal accomplishment being an unrivaled mastery of coloratura. She invariably improvised her own cadenzas, which were always in exquisite taste. She died at Stockholm. A bust of Jenny Lind was unveiled in Westminster Abbey in 1894. Consult: Rockstro and Holland, *Jenny Lind, the Artist* (London, 1891); Rockstro and Goldschmidt, *Jenny Lind, Her Vocal Art and Culture* (London, 1894).

LINDAU, lĭn'dou. An ancient town of Bavaria, in Swabia, situated on an islet at the northeastern end of Lake Constance (Map: Bavaria, C 5). It is connected with the mainland by an old wooden bridge and a railway embankment. It has a good harbor with two lighthouses. The recently restored fifteenth-century Rathaus, with the museum of antiquities, and the ancient Roman tower are interesting structures. The educational institutions of Lindau include a Latin school dating from 1530, a *realschule*, and a library. There are extensive fisheries and an important trade in agricultural and dairy products, iron and wood. Population, in 1900, 5853. Lindau is belived to occupy the site of the *Castrum Tiberii* erected by the Romans against the Vindelicians. The city is mentioned as early as 774 and in 1274 it was a free Imperial city. It joined the Schmalkaldic League in 1531, passed in 1804 to Austria, and in 1805 to Bavaria.

LINDAU, PAUL (1839—). A German dramatist, novelist, and essayist, born at Magdeburg. He studied at Halle and Leipzig. He visited Paris, where he became deeply affected by the French literary spirit, and, returning to Germany in 1863, edited the *Düsseldorfer Zeitung* for a year, went then to Berlin, and in 1866 to Elberfeld, where he edited the *Elberfelder Zeitung*. In 1869 he founded in Leipzig *Das Neue Blatt*, went two years later to Berlin, and in 1872 founded *Die Gegenwart*, which he edited till 1881. In 1877 he founded also *Nord und Süd*. He visited the United States in 1883 as guest of Henry Villard on the occasion of the ceremonial opening of the Northern Pacific Railroad. He traveled widely in our then opening West and published his letters to the *National-Zeitung* of Berlin as *Aus der neuen Welt* (Berlin, 1884). Lindau is author of some sixty volumes of dramas, stories, sketches, and critical or controversial pamphlets, as well as of many dramatic adaptations. The more noteworthy of his critical essays are: *Harmlose Briefe eines deutschen Kleinstädters* (1870); *Litterarische Rücksichtslosigkeiten* (1871); and *Dramaturgische Blätter* (1875-99). To the study of French literature he contributed essays on *Molière* (1872) and *Alfred de Musset* (1877). The more noteworthy of his novels are *Herr und Frau Bewer* (7th ed. 1882) and *Spitzen* (translated as "Lace," 1888). Typical of his dramas are *Die Erste* (1895) and *Der Abend* (1896), but many others are noteworthy for their technic, their instinct of stage effect, and their bright and witty dialogue. Consult Hadlich, *Paul Lindau als dramatischer Dichter* (Berlin, 1876).

LINDAU, Rudolf (1829—). A German novelist, brother of Paul Lindau, born October 10, 1829, in Gardelegen. He was for many years in the consular and diplomatic service of Switzerland and Germany. Lindau studied in Montpellier and Paris; he contributed to the *Revue des Deux Mondes*, the *Figaro*, and the *Journal des Débats*. From 1859 to 1869 he lived in the Far East and in California. In 1864 with Charles Rickerby he founded the *Japan Times* at Yokohama. In 1869 he returned to Germany, was war correspondent in the Franco-Prussian War, and from 1872 to 1878 was employed at the German Embassy in Paris. After that he lived chiefly in Berlin. His writings in French and English prove him a thorough cosmopolitan. Wide travel and keen observation of men and manners are obvious in his works: *Un voyage autour du Japon* (1864); *Peines perdues* (short stories, 1880); *The Philosopher's Pendulum, and Other Stories* (1883); in German, *Die preussische Garde im Feldzuge 1870-71* (1872); *Robert Ashton* (1879); *Schiffbruch* (2d ed. 1880); *Gute Gesellschaft* (2d ed. 1883); *Der Gast* (1883); *Zwei Seelen* (1888); *Martha* (1892); *Liebesheiraten* (1894); *Aus China und Japan* (1896); *Türkische Geschichten* (1891); *Der Fanar und Mayfair* (1898); *Zwei Reisen in der Türkei* (1899). Lindau's *Gesammelte Romane und Novellen* came out in six volumes at Berlin (1892-93).

LINDBLAD, lĭnd′blȧd, Adolf Fredrik (1801-78). A Swedish composer, born at Skenninge, near Stockholm. He went to Berlin to study music under Zelter, but in 1835 settled in Stockholm. He composed many charming songs which were made popular by his pupil, Jenny Lind. They are distinctly Swedish in melody and harmony. He also wrote an opera, *Frondörerna*, a symphony, which was given by the Leipzig Gewandhaus, and a delightful violin sonata. He died in Stockholm.

LINDE, lĭn′de, Samuel Gottlieb (1771-1847). A Polish lexicographer, born at Thorn, Prussia. He studied at Leipzig, where he subsequently taught Polish, and was employed in a private library in Vienna. In 1803 he was appointed director of the lyceum of Warsaw, where he died. His *Wörterbuch der polnischen Sprache* (6 vols., Warsaw, 1807-14; edited by Szajnocha, Lemberg, 1854-60) has retained much of its scientific value.

LINDEGREN, lĭn′de-grĕn, Amalia (1814-91). A Swedish painter, born at Stockholm. She painted for several years without instruction, and then studied at the Stockholm Academy. Afterwards she obtained a traveling purse and studied in Paris under Tissier and Cogniet. Still later she visited Munich, and finally settled in Rome. Her works are genre and portraits, and she is considered the greatest of Swedish women painters. Her "Grandfather and Granddaughter" (1853) is in the Christiania Gallery, and the "Dance in a Peasant's Cottage" is in the Stockholm Museum.

LINDEMANN, lĭn′de-mȧn, Ferdinand (1852—). A German mathematician, born in Hanover. He studied at Göttingen, Erlangen (where he took his degree in 1873), London, and Paris. He began his teaching in Würzburg in 1877, and in the same year was made professor at Freiburg. He was called to a professorship at Königsberg in 1883, and ten years later to a similar position at Munich. He is celebrated for having given the first proof that π is a transcendental number, and that therefore the circle cannot be 'squared' (see the article Circle) by the use of the compasses and the unmarked straight-edge. Lindemann's contributions have been chiefly in the form of memoirs published in the *Proceedings* of the Royal Bavarian Academy of Sciences. He also published *Untersuchungen über den Riemann-Roch'schen Satz* (1879), and edited Clebsch's *Vorlesungen über Geometrie* (1876).

LINDEMANN-FROMMEL, frŏm′mel, Karl August (1819-91). A German painter and lithographer, born at Markirch, Alsace. He studied in Munich under Rottmann, but was also influenced by Olivier. In 1845-49 he lived in Rome, thence went to London, where his water-colors were much appreciated, and once more was attracted to Munich, but soon left it again for Paris, where he first began to paint in oil, and where Ingres showed especial interest in his compositions. In 1856 he settled permanently in Rome, and in 1878 was appointed professor at the Accademia di San Luca. His works are distinguished for romantic conception and lustrous coloring, and include, among many other fine views of Italian scenery: "The Cloister at Albano," in the Vienna Museum; "Gulf of La Spezia," in the Karlsruhe Gallery; "Bay of Naples," and "The Imperial Palaces in Rome."

LINDEN, lĭn′den. A town in the Province of Hanover, Prussia. Until 1885 it was a suburb of the city of Hanover, from which it is divided by the Ihme (Map: Prussia, C 2). It has large machine-works, velvet, woolen, and carpet weaving establishments, and also produces cast iron, chemicals, sugar, rubber, ultramarine, asphalt, wagons, and bricks. Population, in 1890, 28,035; in 1900, 50,423.

LINDEN. Various species of the genus Tilia. See Lime-Tree.

LINDENAU, lĭn′de-nou, Bernhard August von (1779-1854). A Saxon statesman and astronomer, born at Pohlhof, near Altenburg. He studied law and political economy at the University of Leipzig. After serving as assistant judge at the tribunal of Altenburg he became an associate in, and afterwards director of, the Observatory at Gotha. In 1831 he was put at the head of the Saxon Ministry. During his Premiership he remodeled the Saxon administration and adapted it to modern requirements. He resigned in 1843. Of his scientific publications, the following deserve mention: *Tables barométriques pour faciliter le calcul des nivellements et des mesures des hauteurs* (1809), and *Geschichte der Sternkunde im ersten Jahrzehnt des neunzehnten Jahrhunderts* (1811).

LINDEN FAMILY. An order of plants. See Tiliaceæ.

LINDENSCHMIT, lĭn′den-shmĭt, Ludwig (1809-93). A German archæologist, brother of Wilhelm Lindenschmit, the painter. He was born at Mainz, and at first studied art, but in 1846 he gave up art for German antiquities and two years later wrote *Das germanische Totenlager von Selzen*, an important contribution to the subject of Germanic sepulchral mounds. In 1851 he was put in charge of the Germanic Central Museum at Mainz. His publications include: *Die Altertümer unserer heidnischen Vorzeit* (1858-90); *Die Altertümer der merowingischen Zeit* (1880-89); and *Tracht und Bewaffnung des römischen Heeres während der Kaiserzeit* (1882).

LINDENSCHMIT, Wilhelm, the elder (1806-48). A German historical painter, born at Mainz, brother of Ludwig Lindenschmit. He studied at the academies of Munich and Vienna, and in 1826 returned to Munich to assist Cornelius in his decorative work in the arcades of the royal garden, the Königsbau, and the loggia of the Old Pinakothek, and soon afterwards executed in the Castle of Hohenschwangau a series of fresco paintings representing episodes in Bavarian history. Devoting himself next to the painting of easel pictures, he produced among others the "Battle of Arminius" (1839, Karlsruhe Gallery). Called to Meiningen to instruct the hereditary Prince in drawing, he also adorned the ducal castle of Landsberg with a cycle in fresco of scenes from the history of the House of Wettin, then returned to his native city, where he died. His thorough knowledge of history and costume impart additional merit and interest to his impressive compositions, replete with dramatic life, such as the "Entry of Otho the Great into Augsburg After the Victory on the Lechfeld," and "Death of Duke Luitpold in the Battle Near Pressburg," in the Gallery at Mainz, which contains several other specimens of his creation.

LINDENSCHMIT, Wilhelm von, the younger (1829-95). A German historical painter, born at Munich, son of Wilhelm, the elder. First instructed in Mainz by his uncle, Ludwig Lindenschmit, he studied subsequently at the Academy of Munich, at the Städel Institute in Frankfort, then in Antwerp, and finally in Paris, where he produced "The Harvest" and "Duke Alba and the Countess of Rudolstadt," now both in the Hamburg Gallery. From 1853 to 1863 he lived in Frankfort, then settled in Munich, where he was appointed professor at the Academy in 1875 and soon attracted a large following. Among a series of subjects from the age of the Reformation, to which for a time he more especially devoted his brush, may be noted the "Disputation at Marburg;" the "Institution of the Order of Jesuits" (1868); "Ulrich von Hutten Fighting French Nobles" (1869, Leipzig Museum); "Luther's Disputation with Cardinal Cajetan at Augsburg" (Wiesbaden Gallery). To the same period belong "Knox and the Iconoclasts," "Walter Raleigh in the Tower Visited by His Family" (1873, Königsberg Museum); and "Assassination of William of Orange" (1872, Vienna Museum), with life-size figures. Hitherto a peculiar brownish tone had marred the effect of his otherwise powerful compositions, but from 1874 on they gradually partook more and more of the luminous coloring associated with the modern Munich school, while at the same time the artist turned to other fields for his subjects. Examples of this phase are: "Venus by the Body of Adonis" (1874, New Pinakothek, Munich); "Narcissus;" "Entry of Alaric into Rome" (1886); and "Prometheus Bound" (Mainz Gallery). For the Magistrates' Room in the new City Hall at Munich he executed the mural painting, "Progress of Munich Under Ludwig I."

LIN′DERMAN, Henry (1825-79). An American financier, born at Lehman, Pa. He studied medicine in New York, and in 1853 removed to Philadelphia, where he was chief clerk of the Mint in 1855-64, and its director in 1866-69. He made a valuable report on the silver market in 1872; proposed the coinage of the trade dollar; and with Knox drew up the Coinage Act of 1873. As superintendent of the Mint he wrote annual reports, of which that of 1877, arguing for a gold standard, is best known and most important.

LINDH, lĭnd, Anders Theodor (1833—). A Finnish poet, born at Borgå. At first a pupil in the School of Forestry at Stockholm, he afterwards studied law and became one of the magistrates of his native town. His works include two volumes of poetry (1862-1875) which are very popular in Finland; two dramas of less importance, *Konung Birger och hans Bröder* (1864), and *Maria af Skottland* (1865), and a translation of Byron's *Hebrew Melodies* (1862).

LIN′DISFARNE. An island in the North Sea. See Holy Island.

LIND′LEY, John (1799-1865). An English botanist, born at Catton, near Norwich. He early devoted himself to the study of botany, and in 1819 published *Observations on the Structure of Fruits*, a translation from Richard's *Analyse du Fruit*. The next year he published an original work entitled *Monographia Rosarum*. In 1822 he accepted the position of garden assistant secretary of the Horticultural Society, was promoted to assistant secretary in 1826, and in 1830, in conjunction with George Bentham, organized the first flower-shows held in England. He became vice-secretary of the society in 1841 and member of council and honorary secretary in 1858. During the greater part of this time he was also professor of botany at University College, London, and lecturer to the Apothecaries' Company, and did a considerable amount of work for the Government. Among his most important publications are: *Synopsis of the British Flora* (1829); *A Natural System of Botany* (1836); *The Theory and Practice of Horticulture* (1842), which in an earlier form was translated into several other languages; *Ladies' Botany* (1837-

38); and *Flora Medica* (1838). In addition he edited a number of scientific works, and at various times conducted several periodicals which dealt with his branch of science.

LINDLEY, Sir NATHANIEL (1828—). An English jurist. He was born at Acton Green, Middlesex; was educated at University College, London, and was called to the bar at the Middle Temple in 1850. He was appointed Queen's Counsel in 1872 and judge of the Court of Common Pleas in 1875, when he was knighted. From 1881 to 1897 he was Lord Justice of Appeal, and from 1897 to 1900 Master of the Rolls. In 1900 he became Lord of Appeal in Ordinary, and was created Baron Lindley. His publications include: *Introduction to the Study of Jurisprudence* (1855), and *Treatises on the Law of Partnership and Companies* (6th ed. 1893).

LINDNER, lĭnt′nĕr, ALBERT (1831-88). A German dramatist, born at Sulza and educated at Jena and Berlin. His earlier plays, *Dante Alighieri* (1855) and *William Shakespeare* (1864), were succeeded by the popular *Brutus und Collatinus* (1867). Among his later plays are *Staud und Welf* (1867); *Katharina II.* (1868); *Die Bluthochzeit oder die Bartholomäusnacht* (1871), a great success; *Marino Falieri* (1875); *Don Juan d'Austria* (1875); and *Der Reformator* (1883). Consult Hanstein, *Albert Lindner, Leben und Werke* (Berlin, 1888).

LINDNER, THEODOR (1843—). A German historian, born at Breslau, and educated there and in Berlin. In 1876 he went to Münster as professor of history, and from there in 1888 to Berlin. His works include: *Geschichte des deutschen Reiches vom Ende des vierzehnten Jahrhunderts bis zur Reformation* (1875-80); *Kaiser Heinrich IV.* (1881); *Urkundenwesen Karls IV. und seiner Nachfolger* (1882); *Geschichte des deutschen Volkes* (1894); *Der Krieg gegen Frankreich und die Einigung Deutschlands* (1895); and *Weltgeschichte seit der Völkerwanderung* (part i., 1901).

LIN′DO, MARK PRAGER (1819-77). A Dutch author, born in London, of English parentage. He studied at Boulogne and Düsseldorf; taught in the military school at Breda from 1853 to 1865, and in the latter year went to The Hague as inspector of education in South Holland. Under the pseudonym *De oude heer Smits*, he made himself famous by his sketches in the *Arnhemsche Courant.* They were published in book form (1858-65), and were collected in five volumes as *Kompleete werken van den ouden heer Smits* (1877-79). In the *Nederlandsche Spectator*, founded by him in 1856, much of his best work appeared: *Clementine* (1858), *Le Saltimbanque* (1859), and *De geschiedenis van een gentleman* (1862). He translated into Dutch Sterne's *Tristram Shandy* and many of the novels of Thackeray, Scott, Fielding, Dickens, and others. His last work was the historical *Opkomst en ontwikkeling van het Engelsche volk* (1868-74).

LINDPAINTNER, lĭnt′pĭnt-nĕr, PETER JOSEPH VON (1791-1856). A German musical conductor and composer, born at Coblenz. He studied at Augsburg, then at Munich under Winter, and somewhat later under Grätz, the contrapuntist. His *Te Deum* was successfully produced in 1811. From 1812 to 1819 he was director of music at the Isarthor Theater of Munich, and from 1819 until his death was Court Kapellmeister at Stuttgart. He developed at Stuttgart one of the best of German orchestras. In 1853 he conducted the New Philharmonic concerts in London. As a composer he lacked originality and depth, but was clear, brilliant, and musician-like. Many of his songs, notably *Die Fahnenwacht*, were very popular in their time. His symphonies and his music to Schiller's *Lied von der Glocke* and Goethe's *Faust* are reckoned among the best of his works. He also wrote twenty-eight operas, of which the chief are *Der Vampyr* (1829), and *Lichtenstein* (1845), instrumental works, vocal chamber music, and other compositions.

LINDSAY, lĭn′zĭ. The county-seat of Victoria County, Ontario, Canada, on the Scugog River, and on the line of the Grand Trunk Railway, 69 miles northeast of Toronto (Map: Ontario, E 3). It contains the county buildings and several fine churches and schools. It is an important railway centre, with a trade principally in lumber, grain and flour, and manufactures of doors, sashes, blinds, ironwork, beer, and extract of hemlock bark. The United States is represented by a consular agent. Population, in 1891, 6081; in 1901, 7003.

LINDSAY. A Scottish family of Norman extraction. One of the race obtained lands in England from William the Conqueror; another, Sir WALTER DE LINDSAY, settling in Scotland under David I., acquired Ercildoun and Luffness in East Lothian. The more prominent among a long list of illustrious descendants are the following: WILLIAM LINDSAY of Ercildoun, High Justiciary of Lothian in the latter half of the twelfth century, who acquired the lands of Crawford in Clydesdale; he married Princess Marjory, sister of King William the Lion, and had three sons, the eldest of whom inherited Crawford.—Sir ALEXANDER LINDSAY, younger brother of Sir James Lindsay of Crawford (conspicuous at the battle of Otterburn), and his son DAVID, who became chief of the family, married the sister of Robert III., and was raised by that King in 1398 to the dignity of Earl of Crawford.—DAVID, fifth Earl, a faithful friend of James III., and employed by him in his most important foreign embassies, who was made Duke of Montrose in 1488, a title which had never before been bestowed in Scotland but on Princes of the blood royal.—Sir JOHN LINDSAY, who in 1445 was created Lord Lindsay of the Byres; the tenth Lord Lindsay of the Byres, in 1644 created Earl of Lindsay, who also became seventeenth Earl of Crawford, and held the offices of High Treasurer of Scotland and Extraordinary Lord of Session; Lord MENMUIR, a Lord of Session and Secretary of State to James VI.; and ALEXANDER WILLIAM LINDSAY, twenty-fourth Earl of Crawford and Balcarras (q.v.).

LINDSAY, ALEXANDER WILLIAM CRAWFORD, Earl of Crawford and Balcarras. See CRAWFORD AND BALCARRAS.

LINDSAY, or **LYND(E)SAY,** Sir DAVID (c.1490-1555). The most popular of the early Scotch poets. He seems to have been born at Garmylton. He studied at the University of Saint Andrews about 1505-08, and seems to have attached himself at once to the Scottish Court as equerry (1508). In 1511 he took part in a play before James IV. and Margaret Tudor at

Holyrood. He became an usher to Prince James, afterwards James V. of Scotland, an office which he held till 1522. In this year he married Janet Douglas, described as the King's seamstress. About 1528 James V. appointed him Lyon king-of-arms (chief Court herald), in which capacity he was sent on several diplomatic missions. He died before April 18, 1555. The earliest of his poems, *The Dreme* (about 1528), is an allegory written in the seven-line stanza of Chaucer. The poet is conducted by Dame Remembrance through earth to hell and purgatory, back to the earth, and finally to heaven. The vision closes with an account of the dreadful state of Scotland—the robbery and oppression in the Highlands and on the borders. This poem was soon followed by *The Testament and Complaynt of our Soverane Lordis Papyngo* (1530), a satire on the Court, prelates, and nobles, and by the *King's Flyting* (1536?), an audacious rebuke of the King's licentiousness. For the feast of Epiphany, January 6, 1540, Lindsay wrote his famous morality play, *Ane Satyre of the Thrie Estaitis*, in which he denounced with especial severity the clergy. A year or two before his death he completed a long poem (6333 lines) called *The Monarchie*, which gives an account of the rise and fall of Assyria, Persia, Greece, and Rome, closing with a prophecy of the fall of the fifth world-monarchy, the Church of Rome. Other poems are: *The Complaynt of Bagsche, the Kingis auld Hound, to Bawtie, the Kingis best belovit Dog, and his Companions*, a satire on the Court; *The Historie and Testament of Squyer Meldrum*, a metrical romance, having as a hero a contemporary Scotch laird; *Kittie's Confessions*, aimed at the confessional; and *Ane Description of Peder Coffer*, an exposure of peddlers' tricks. For a century Lindsay's satires, abounding in humor and proverbial philosophy, were read throughout Scotland. They seem to have lost their popularity chiefly because the language in which they were written became unintelligible to all except scholars. In furthering the Reformation in Scotland they played a part hardly second to the sermons of John Knox. *The Thrie Estaitis* occupies a considerable place in the development of the drama. Consult his *Poetical Works*, ed. by Laing (2 vols., Edinburgh, 1879); and *Works*, ed. for Early English Text Society (5 parts, London, 1865-71).

LINDSAY, Robert. A Scotch chronicler, called, from his birthplace, Pitscottie (q.v.).

LINDSAY, Thomas Bond (1853—). An American linguist and educator, born in New York City. He graduated at Wesleyan University in 1874, and then studied in Germany. In 1878 he became assistant professor of Latin and Sanskrit at Boston University, and in 1884 was promoted to a full professorship. He wrote several articles on Latin poets for Warner's *Library of Best Literature;* edited Cornelius Nepos (1882 and 1895), Juvenal (1890), and Catullus (1902); and published *Easy Latin Lessons* (with Rollins, 1890) and *Sight Slips in Latin* (1892).

LINDSAY, Wallace M. (1858—). A distinguished Latinist, born in Fifeshire; educated at Glasgow University and Balliol College, Oxford; Fellow of Jesus College, 1880-99. In the latter year he was appointed professor of humanity at Saint Andrews University, Scotland. His contributions to classical learning have been chiefly in the fields of historical grammar of the Latin language and the study of Plautus. His publications include: *Latin Language* (Oxford, 1894, the most important work on the subject in English); *A Short Historical Latin Grammar* (Oxford, 1895); *Introduction to Latin Textual Emendation* (London, 1896); *Palatine Text of Plautus* (Oxford, 1896); *The Codex Turnebi of Plautus* (Oxford, 1898); *Plautus' Captivi* (2d ed. London, 1902); *Nonius Marcellus* (Oxford, 1901), etc.

LINDSAY, William (1835—). An American lawyer, born in Rockbridge County, Va. He was educated in Virginia, and in 1854 removed to Hickman County, Ky., where he taught school, studied law, and in 1858 was admitted to the bar. He entered the Confederate service at the outbreak of the Civil War, was a captain in the Twenty-second Tennessee Regiment, and an aide on the staffs of Generals Buford and Lyon. At the close of the war he resumed his law practice at Clinton, Ky., from which place he was elected as a Democrat to the State Senate in 1867. In 1870 he was elected to the bench of the Kentucky Supreme Court, and from 1876 to 1878 was Chief Justice of the State. He then declined a renomination, and resumed his practice at Frankfort. He was again in the State Senate in 1889, was a commissioner of the World's Columbian Exposition in 1893, and in the same year was elected to the United States Senate to fill the vacancy caused by the resignation of John G. Carlisle, who had been appointed Secretary of the Treasury by President Cleveland. In 1894 he was reëlected for the full term of six years, but, being a 'sound-money' man, before the close of his term had become estranged from his party and voted generally with the Republicans. After his retirement from the Senate he practiced law in New York City, and in 1901 was appointed by President McKinley a commissioner for the Louisiana Purchase Exposition at Saint Louis.

LINDSBORG, lĭnz'bôrg. A city in McPherson County, Kan., 206 miles west by south of Kansas City; on the Smoky Hill River, and on the Union Pacific and the Missouri Pacific railroads (Map: Kansas, E 3). It is the seat of Bethany College (Lutheran), opened in 1881, consisting of twelve departments, including a musical conservatory which is widely known for its annual 'Messiah' concerts. The city is the centre of several large Swedish Lutheran colonies, and is the location of the Bethany Book Concern, the Lutheran publication house for the West. It has considerable trade in grain, broom-corn, live stock, farm produce, etc., and manufactures flour, brooms, and brick. Population, in 1890, 968; in 1900, 1279.

LINDSEY, lĭn'zĭ, Charles (1820—). A Canadian author. He was born in Lincolnshire, England, and in 1841 went to Canada, where he was employed on the staff of the Toronto *Examiner* and of the Toronto *Leader*. His publications include: *Clergy Reserves* (1851); *Prohibitory Liquor Laws* (1855); *Life and Times of William Lyon Mackenzie* (2 vols., 1862); *An Investigation of the Unsettled Boundaries of Ontario* (1873); and *Rome in Canada* (1877).

LINDS'LEY, John Berrien (1822-97). An American physician and educator, born at Princeton, N. J. After graduating at the University of Nashville in 1839, he attended the medical schools of the universities of Louisville and Pennsylvania, and graduated at the latter in 1843. He also studied theology and was ordained in 1846 to the Presbyterian ministry. From 1850 to 1870 he was professor of chemistry in the University of Nashville, and from 1853 to 1873 chancellor of the university. In 1850 he assisted in organizing the medical department of the institution and became its first dean. He organized Montgomery Bell Academy, and had a part in the establishment of the Tennessee College of Pharmacy, where he occupied the chair of materia medica from 1876 until his death. In the University of Tennessee he was professor of chemistry and State medicine from 1880 to 1897. He edited for many years the *Nashville Journal of Medicine and Surgery*, and contributed extensively to periodical literature on scientific and religious subjects. He published *Our Ruin: Its Causes and Cure* (1868), and was the editor of *The Military Annals of Tennessee* (1886).

LINE (AS. *line*, OF., Fr. *ligne*, It. *linea*, from Lat. *linea*, thread, line, from *linum*, Gk λίνον, *linon*, flax). A military and naval term, applied to the regular regiments of artillery, cavalry, and infantry, in distinction from engineers and special corps or departments. While it applies universally, it has more special reference to the armies of the United States and Great Britain. Originally it referred to the troops constituting the regular line of battle. In England the terms *marching regiment* and *marching officer* were formerly much used, as synonymous with line regiment and line officer. *Line formation* is a formation in which the men, horses, or guns constituting the line are abreast of each other. It is the order in which infantry formulate their attack.

In the navy there is a similar usage and the line or combatant officers are distinguished from those with other duties such as the medical corps, pay corps, etc. The engineers (see ENGINEERS, CORPS OF) were originally included among the staff officers, but by the Organization Act of 1899 they take actual rank and commissions as line officers, though still pursuing engineering duties. In European navies the term is used to distinguish the officers serving in the regular navy from those in the naval reserve or on coast guard or other duties.

LINE. A term used in the Fine Arts, by extension of its original meaning, as synonymous with drawing. The use of line in representation of visual objects in general is discussed under DRAWING and PERSPECTIVE; this article will confine itself to its use in painting. Line is of equal importance with color in a picture, the greatest colorists of the past, like Titian and Tintoretto, having also been good draughtsmen. In fact, the character of a picture is often determined by the prevailing character of its lines, which is generally indicative of a particular sentiment, of which it forms the expression. (See COMPOSITION.) It is impossible to discuss here the studio maxims and rules of drawing. There is, of course, such a thing as an abstract beauty of line. Curves strike us as being more beautiful than unvarying straight lines, and compound and reversed curves than simple ones. In like manner we feel that lines could continue each other smoothly, as in the human figure. But the following of cast-iron maxims would restrict the artist in practice, and destroy for the amateur the enjoyment of many of the most beautiful works of art.

As regards line in a picture there are two distinct points of view: the classical, or academic, and the picturesque, or naturalistic. The former sees in line the chief, almost the only merit of a picture, relegating color to a position entirely subordinate. Its chief subject is the human figure, and it attempts by uniting many individual perceptions to reach the ideal. The picturesque, on the other hand, endeavors to give the soft outlines of nature, and is concerned rather with the general effect than with details. Its chief purpose is to give the character of objects, the appearance of life, and to do this it emphasizes salient points to the neglect of details. The character of drawing used in the portrayal of an object—whether classical or picturesque—is determined by the nature of the object, the purpose of the artist, and, above all, by his individuality.

Among ancient peoples the Greeks were very accurate draughtsmen, this being the only respect in which their painting equaled that of modern times. Among the Italians the Florentines, from Giotto to Michelangelo, were preeminent in line, though it was also the forte of the Paduan school (Mantegna), and the Umbrians produced, under Florentine influence, masters like Signorelli and Raphael. The Flemings of the fifteenth century (Van Eych, Memling), and the Germans of the sixteenth (Dürer, Holbein) also excelled in line. The Venetians were colorists rather than draughtsmen, as were also the Spaniards (Velasquez) and the Netherlanders (Rubens, Rembrandt). Classical drawing was carried to the most logical extreme by David and his followers in France, the picturesque view being represented by Delacroix and the Romanticists, whose successors in this respect, the Impressionists, almost deny the existence of line. Most artists of the present day, however, combine both points of view in their practice. Consult the authorities referred to under COMPOSITION.

LINE, MATHEMATICAL. A magnitude of only one dimension, defined as the path of a moving point or the boundary between adjacent portions of a surface. Lines are classified as *straight*, *broken*, *curved*, or *mixed*. The broken line is composed of straight lines. A mixed line is composed of straight and curved lines.

LÍNEA, lē′nä-ȧ, LA. A town of Spain. See LA LÍNEA.

LINEAL (Lat. *linealis*, relating to a line, from *linea*, line). In law, a term employed to describe the relationship of persons who constitute successive generations in a direct line of descent from a common ancestor, and therefore bear the relation of ancestor and descendant to each other. It is the direct opposite of 'collateral' as applied to consanguinity or relationship, which means persons who have a common ancestor, but do not bear the relation of ancestor and descendant as to each other, as cousins, who have a common ancestor on either the paternal or maternal side, but have not the same immediate ancestors, that is, their parents. See COLLATERAL; CONSANGUINITY; DESCENT; RELATIONS.

LINEAR ACCELERATION. See MECHANICS.

LINE-ENGRAVING. That which is done with the burin, the only tool in common use. The term 'line-engraving' is almost wholly limited to such engraving as is intended for printing off upon paper. The burin is a slender steel bar, square, or more rarely triangular in section, with this peculiarity, that its working end is cut off in the direction of the diagonal plane so that the most projecting point—that farthest from the handle—is a not very acute solid triangle bounded by three planes, which meet in very sharp edges. This steel bar is set in a short wooden handle having a rounded form so shaped that the hand may push it strongly, point on. When this tool is forced along the surface of a metal plate with the axis of the steel bar slightly inclined to the surface of the plate, it cuts a groove, forcing out the metal in a curled shaving: and according as it is forced in more or less deep it makes the incision more or less wide. The artist having before him, let us say, a patch of shade in the drawing which he is to copy, that patch having a definite size and the depth of the shade varying in an artistic gradation from light to dark, it is his business to reproduce that shade on the paper which is to be printed from his engraved plate by means of applied ink; and therefore, as he has at his disposal only solid black lines by which to represent shade, he has to decide on the number, the direction, the fineness, and the closeness of the setting of those lines.

Some burinists have worked with very fine lines, put in as simply as those of the etcher: short lines, nearly parallel, drawn with all the apparent ease of a pen and ink draughtsman. Others, especially the line-engravers of the seventeenth and eighteenth centuries, have used lines of varying breadth, very wide in some part of their length and tapering to a point, or nearly so; and these lines have been used in one system, nearly parallel to one another, and have also been used crossing each other like the cross-hatching recommended by some teachers of drawing in black and white. A still further development of the process has involved the putting of a dot or cut in the metal in each lozenge-shaped space left by such cross-hatching; but this has not been approved by the critics of later times and may be thought to be abandoned. Line-engraving has not been in very common use since the middle of the nineteenth century, and this, in part, because of the strong feeling caused by the use of etching and dry-point work by artists to render their own thoughts, with the result that line-engraving, a process much too slow and mechanical to please the artist who is accustomed to painting or drawing in monochrome, is neglected except for the reproduction of paintings and the like. The very common use of line-engraving to do just such work as that, namely, the close copying of pictures and statues in the public galleries of Europe, has aided in this general condemnation of burin work as dull and uninteresting. The production, since 1850, of a few works of the burin in which great artistic intelligence and much originality is shown has not sufficed to restore the popularity of the art. Moreover, the immense advance in photographic engraving of all sorts has helped in the comparative abandonment of this with the other uses of the engraver's art.

History. As stated in the article **Engraving**, the custom of printing trial impressions of niello plates may have originated the art of engraving for printing upon paper. This origin must have taken place in the course of the fifteenth century, and the result of the newly invented process is found in such early work as that of Baccio Baldini. His prints are, of course, rare, but they do not need rarity to make them singularly valuable, both historically and in the way of artistic merit. Contemporary with them are a great many small prints, known to collectors as *niello* or niello prints, these being evidently made by rubbing with ink the coppers prepared for niello work and taking impressions on paper to show the design. From 1450 until the close of the century these works and those of Robetta of Florence, those of Lombardy, and those of Martin Schongauer of Southeastern Germany, represent a great part of the artistic movement of the time. The earliest engravings, whether of Italian or German origin, show a very imperfect knowledge of the power of the burin and the resources of the burinist's art. The outline is drawn on the metal with singular grace and charm, this extending even to the most refined qualities of facial expression; but this outline is not supported by a complete system of light and shade. The burin is used for thin and light lines only, usually very short, hardly to be distinguished from the lines of the etcher; and where there is opportunity for elaborate line work, as in the drawing of flowing hair, the delicate, nearly parallel lines by which the effect is produced are evidently a habit of the skilled engraver on metal for original decorative effect, without thought of printing. The work of Jacopo dei Barbari (the master of the Caduceus), an artist of whom little is known, is among the most poetical of the time, and Sandro Botticelli, in his designs for the illustration for Dante—designs thought to have been engraved by Baccio Baldini—is supposed also to have engraved a few plates himself. In fact, the painters of the time experimented with the burin very nearly as the painters of the second half of the nineteenth century worked with the etching-needle, trying to familiarize themselves with the new process and to express their thoughts in black and white in this enduring form. It is important to note that the early engravers had no thought of the comparative lowering of their art to a process of mere copying.

The sixteenth century is a time of amazing fertility and artistic results in line-engraving. Especially during the years previous to his death in 1528 Albert Dürer produced designs of extraordinary originality and refined sentiment. His most famous pieces are the "Melancholia" and the so-called "Night and Death;" but his "Adam and Eve" (one of his earliest works in black and white), the noble designs called the "Coat of Arms with the Skull" and the "Coat of Arms with the Cock," and several of the portraits, are of equal artistic importance. (For details, see **Dürer, Albrecht**.) In the Low Countries Lucas Van Leyden worked until 1533, and his design in black and white, as shown in his prints, though feeble compared with the magnificent strength of Dürer, is charming for its quaintness; and his portrait work has singular attractiveness because of its apparent fidelity to individual expression and to details of costume. Barthel Beham produced less work than his predecessor and probable teacher, Dürer, his life being short, but he is known as the maker of the finest burin engraving existing if technical qualities are considered, and one equal to any similar artistic work of the kind, viz. portraiture, in loftier expressional qualities. This astonishing print is the portrait of the Emperor Charles V. in his youth, the plate being dated 1531. Marcantonio Raimondi (q.v.) has been the most reputed and admired of burin engravers, but this largely because of the traditional dependence of his art upon the teachings of Raphael, and the fact that he reproduced many of Raphael's drawings, now lost—these reproductions being not necessarily close, though having much of the original significance. In a curious way Marcantonio links together the earliest and the later schools of line-engraving: for he has a refinement of outline in no way supported by his system of light and shade, in which he resembles the earliest men, while his deliberate preference of a life of copying to the career of an original designer in black and white makes him in a way the founder of that unfortunate later school which looked upon line-engraving as a technicality, to be used only for the rendering, usually inadequate, of important pictures. Agostino Carracci (q.v.) worked during the second half of the sixteenth century, producing original designs as well as copies, and in France the able workmen Abraham Bosse and Israel Silvestre carried the traditions of originality and native force far into the seventeenth century. Poetical inspiration was denied them, but they have left an admirable record of their time in designs of complete individuality.

During the reign of Louis XIV. France was at the head of Europe in the art of engraving and was represented by Robert Nanteuil (q.v.), Gérard Edelinck, a Fleming, who had migrated to Paris, and Antoine Masson, who worked after paintings by the great artists of the day, but without a minute adherence to the original. Nanteuil was indeed the inventor of those devices, those combinations of lines and dots and that excess of cross-hatching, which were so abused by his successors; but his own work is of almost uniform good taste and dignity—formal, indeed, in the spirit of the time, but retaining a force and fire rather characteristic of the original work than of the copyist. Jean Pesne engraved the paintings of Poussin with a similar boldness, transferring the artist's composition from the canvas to the smaller study in black and white. Gérard Audran (d. 1703) was able to give power to huge prints, rather closely studied from the paintings of his contemporaries, Mignard and Poussin, as well as to reproductions of Raphael's wall pieces.

In the eighteenth century line-engraving is delicate and refined and the portraits of the time are of singular interest, but it is devoted to a more feeble system of design and largely used for book illustration. The celebrated *Livres à vignettes*, illustrated by Charles Eisen, Charles Nicolas Cochin, Pierre Philippe Choffard, and Nicolas De Launay, as the most celebrated of a large school of engravers, form a separate branch of art study, the number of the works being very great and their merit singularly uniform. In still later times, Volpato (d. 1803) and Raphael Morghen (d. 1833) carried over the assumed grand style of the earlier workmen into the nineteenth century; and with their works closes the history of line-engraving of the traditional school. Everything since the Napoleonic wars has been in a way tentative. Here and there powerful and self-centred artists like François Forster (d. 1892) and Henriquel-Dupont (d. 1892) followed a resolute course, working in the spirit of such a period or such a master of the past as their personal characteristics made easy, and producing valued prints. Since 1850 line-engraving has been kept alive mainly by the Government institution La chalcographie de Louvre, there being only one or two very exceptional artists to glorify the second half of the nineteenth century. The chief of these, Ferdinand Gaillard, is one of the greatest artists in black and white of our time.

LINEN (AS. *linen*, from *lin*, flax, from Lat. *linum*, flax). The term linen is usually applied to fabrics woven from the fibre of flax (q.v.), although materials made from hemp or even jute are sometimes called by this name. Linen is one of the oldest of all textile manufactures, at least it is one of the earliest mentioned in literature. The cerecloth, in which the most ancient mummies were wrapped, proves its early and very extensive use among the Egyptians, and it is said that the very finest linen of the present day looks coarse beside that from the Egyptian looms in the days of the Pharaohs. It formed also parts of the garments of the Hebrew as well as the Egyptian priests. The wonderful durability of linen is evidenced by its existence on mummies, and by the remarkable fact mentioned by the German writer Seetzen, and referred to by Blumenbach, that he had found several napkins within the folds of the covering of a mummy which he unwrapped, and that he had them washed several times without injury.

Linen was made in England at an early date, the garments of the ancient Anglo-Saxons being linen and woolen. The Bayeux tapestry is a linen cloth, embroidered in wool. Although the weaving of linen had been conducted as a household industry for many centuries, it was first manufactured in England on a large scale by Flemish weavers under the protection of Henry III., in 1253; it was not until eighty years after that a colony of Scots planted themselves in the northeast part of Ireland and established there the linen manufacture which has since become a national industry. In Continental Europe linen was extensively made throughout mediæval times. Charlemagne is said to have worn linen underclothing, after the fashion of the Franks. The Moors of Spain were renowned for their beautiful linen and other textiles, which were exported to Oriental countries. In the fifteenth century Seville had 16,000 looms. As early as the eleventh century Flanders, Brabant, and many French and German towns became famous for fine linens. The soil of the Netherlands and of France seems peculiarly adapted to the production of flax of a superior quality, and here the manufacture of linen reached its greatest perfection. The stimulus to produce fine yarns (see SPINNING; also LACE) for the lacemakers gave rise to such care and attention in the cultivation and preparation of flax that in point of fineness of fibre they have been unequaled. Consequently the linens of France, Belgium, and Holland have long enjoyed a well-deserved reputation, and in the manufacture of lawn and cambric, which are the finest kinds of linen cloth made, the French are unrivaled. In the ordinary kinds of linen those of Ireland, especially, are remarkable for their excellence, and this trade is a very important one in that country, while in Scotland a large trade in the coarser and inferior kinds has been established. The manufacture in the American colonies was of slow growth, outside of families, but as early as 1731 brown holland was produced in Massachusetts. In 1809 the Legislature of Kentucky petitioned Congress to protect the linen industry of the United States, claiming that Kentucky already supplied the greater part of the cotton country with baling linen, and could easily raise hemp enough for the entire Union.

Flax is reduced to thread by spreaders, drawing and roving frames, and finally by carding and spinning, in the same general manner as other fibres. (See SPINNING.) But while coarse thread is spun dry, like that of cotton, wool, and silk, the finer thread has to be spun wet. The temperature of the water used is about 120° F.

The chief kind of linen manufactured, besides yarn and thread, is lawn (Fr. linon) the finest of flax manufactures, formerly exclusively a French production; but very fine lawns, such as cambric, damask, and diaper, are now made elsewhere.

Of the finer plain fabrics, sheetings are the most important. Common sheeting and toweling are extensively manufactured in Scotland, and the latter to a moderate extent (6,649,862 square yards, valued at $752,891 in 1900) in the United States. Ducks, huckabacks, osnaburgs, crash, and tick (corrupted from *tieken* and *dekken*, Dutch for cover) are very coarse and heavy materials, some fully bleached, others unbleached or nearly so. They are chiefly made in Scotland, and also at Leeds and Barnsley in England. Varieties of velvet and velveteen are also made of flax and much linen yarn is used as warp. Linen is often mixed with jute or with cotton, each of which, on account of its greater cheapness, has usurped the place of linen in certain branches of textile manufacture. Indeed, there has been in recent years a marked decline in the production of flax and manufacture of linen in most European countries.

LINEN GOODS, KIND, QUANTITY, AND VALUE OF PRODUCTS MANUFACTURED IN THE UNITED STATES IN 1900
From Twelfth United States Census

	Quantity	Value
Flax or hemp yarn, tow....pounds	4,178,117	$556,392
Flax or hemp yarn, line..... "	232,426	53,078
Twine, all flax.................... "	1,658,438	366,993
Twine, all hemp................ "	765,122	124,516
Linen thread....................... "	3,921,044	2,315,287
Toweling, all linen..........sq. yards	4,598,615	471,633
Toweling, partly linen.... "	2,051,247	281,258
Other woven fabrics, all linen............................ "	33,000	9,110
Other woven fabrics, partly linen.................. "	135,000	34,000
Other spun or woven goods..........		152,608
All other products........................		3,284
Total..................................	....	$4,368,159

The manufacture of linen fabrics in the United States is practically confined to the making of thread, twine, and toweling. In 1900 eighteen establishments were engaged in linen manufacture, as against five in 1890. The output of these establishments is not only pure linen, but combinations with hemp, jute, or cotton. The capital invested in these linen factories in 1900 was $5,688,999, and the value of the product $4,368,159. This product is distributed as shown in the accompanying table.

LINEN WEDDING. See WEDDING ANNIVERSARIES.

LINE OF SIGHT, LINE OF DEPARTURE. See BALLISTICS.

LINES OF FORCE, ELECTRIC. See ELECTRICITY.

LINES OF FORCE, MAGNETIC. See MAGNETISM.

LING (MDutch *linghe*, *lenghe*, Dutch *leng*, Ger. *Länge*, *Leng*, ling, from AS. *lang*, Goth. *laggs*, OHG., Ger. *lang*; connected with Lat. *longus*, OChurch Slav. *dlŭgŭ*, Lith. *ilgas*, OPers. *drũnga*, Skt. *dirgha*, long). An important species of cod, *Molva molva*, abundant throughout the Northern European seas, and in value almost rivaling the cod. In form it is much more elongated than the cod, has two dorsal fins and one anal fin, and has a barbel at the extremity of the lower jaw. The ling is generally three or four feet long, sometimes more, and has been known to weigh 70 pounds. The color is gray, inclining to olive; the belly, silvery; the fins edged with white. The ling is a very voracious fish, feeding chiefly on smaller fishes. It is also very prolific, and deposits its spawn in June, in soft oozy ground near the mouths of rivers. It is found chiefly where the bottom of the sea is rocky. Great numbers are caught in the same manner as cod, by hand-lines and long lines, and are sent to the markets in the form of 'stockfish.'

In the United States the fresh-water cod (*Lota maculosa*) is known about Lake Ontario by this name. See BURBOT.

LING. A plant of the genus Erica. See HEATH.

LING, PEHR HENRIK (1776-1839). A Swedish poet and inventor of the Swedish form of gymnastics, born at Ljunga, in the Province of Småland. Of an adventurous spirit, as a young man he traveled through Germany and France. In 1805 he was made fencing-master at the University of Lund, in 1813 teacher of fencing at the military school of Karlberg. A few years later he went to Stockholm and founded there a gymnastic institute, of which he remained director until his death. He received the title of professor in 1825, and was elected member of the Swedish Academy ten years later. His poetic works were addressed to the patriotism of the Swedes, and in them he dramatized the whole of Swedish history. He played the part in Sweden that Turnvater Jahn did in Germany. Some of his works are: *Gylfe*, an allegorical poem (1812); the dramas *Agne* (1812) and *Eylif* (1814); the *Epos Asarne* (1816-26); and *Engebrecht Engelbrechtson* (1819), a drama. Ling bestowed much thought and labor upon his profession and developed his gymnastic exercises, which at first were simply a means of strengthening the body, into a system of movements which became known as the Swedish movement cure, extensively used in the treatment of many chronic diseases. See the article MOVEMENT CURE.

LINGA, lĭŋ'gȧ (Skt., symbol). In the sectarian worship of the Hindus, the emblem of the generative power of nature. The Linga-worship prevails with the Saivas, or adorers of Siva. The manner in which the Linga is represented is generally inoffensive—the pistil of a flower, a pillar of stone, or other erect and cylindrical objects, being held as appropriate symbols of the generative power of Siva. Its counterpart is the *Yōni*, or the symbol of female nature as fructified and productive.

LINGAH, lĭn-gä′. A seaport of Persia, the second in importance, situated in the Province of Laristan, on the Persian Gulf, just west of the Strait of Ormuz, and about 300 miles southeast by sea from Bushire (Map: Persia, E 7). It has an important bazaar. There is an extensive transit trade, the main item being pearls, which pass through Lingah on the way from the Arabian fisheries to India. Other articles in its trade are rice, gold, and cotton stuffs. The total value of the commerce of the port amounted in 1900 to about £972,000. Lingah has regular steam communication with British India, and has a British post-office. The population is estimated at 15,000, including a large number of Arabs. Arabs held the port until 1898, when Persian troops took possession.

LINGARD, lĭŋ′gärd, JOHN (1771-1851). A Roman Catholic historian of England. He was born of humble parentage at Winchester, February 5, 1771, and, being destined for the priesthood, was sent to the English college of Douay, in France, where he remained until that college, in common with most of the religious establishments of France, was broken up by the disorders of the Revolution. On his return to England in 1793 he became tutor in the family of Lord Stourton. The act called the Catholic Relief Act having enabled Catholics to open schools in England, the Douay community was transferred to Crookhall, and ultimately to Ushaw, near Durham. In 1794 Lingard rejoined his companions at Crookhall, where after entering the priesthood he continued as professor of philosophy, prefect of studies, and vice-president until 1811, when he accepted the humble cure of Hornby, near Lancaster, which he continued to fill until his death, July 17, 1851. Lingard's first important work was the *Antiquity of the Anglo-Saxon Church* (1806, reprinted in 1810, and afterwards in a much enlarged edition of two volumes, 1845). This was but the pioneer of what eventually became the labor of his life, his *History of England until 1688*, in eight quarto volumes (London, 1819-30). Before his death it had passed through six editions, frequently revised, the last of which, in ten volumes, appeared in 1854-55. From its first appearance it attracted much attention, being founded on a careful study of the original sources. Although written in a conciliatory spirit, it was criticised with considerable asperity in its polemical bearings; but the author in his replies displayed so much erudition and such careful consideration of the original authorities that the result was to add materially to his reputation as a scholar. He was the recipient of many honors in recognition of his services, among others of a pension of £300 from the Crown. There is a memoir of his life by Canon Tierney prefixed to the 6th edition of the *History of England*. Consult: Gardiner and Mullinger, *Introduction to the Study of English History* (London, 1881); Husenbeth, *Notices of the English Colleges and Convents* (Norwich, 1849).

LINGAYÉN, lēn′gȧ-yān′. The capital of the Province of Pangasinán, Luzon, Philippines (Map: Luzon, C 2). It is situated at the head of the Gulf of Lingayén on a low and fertile alluvial island in the delta of the Rio Ango. It is built partly of stone and has a handsome church, a post-office and telegraph station. It is an important trade centre, and, through its station, Dagupán, six miles to the east, is connected by a railroad with Manila. It was founded at the end of the sixteenth century by the Augustine Fathers, who in 1611 retired in favor of the Dominicans. Population, in 1898, 18,886.

LINGAYÉN, GULF OF. A large bay or gulf of the China Sea indenting the western coast of Northern Luzon, Philippines. It is 325 miles wide at the entrance between Santiago Island on the west and Point San Fernando on the east; it extends inland about 30 miles. It is exposed to squalls and typhoons, the latter especially in September and October. The eastern shore is bordered by high mountains; the southern is low, and consists of the large delta of the Agno River. The largest islands are Santiago and Cabarruyán. The principal ports on the gulf are Saint Thomas on the east, and Lingayén and Port Sual on the south shore.

LINGELBACH, lĭng′*el*-bäG, JAN (1622-74). A Dutch painter, born at Frankfort-on-the-Main. He went to Amsterdam in 1637, was in Paris in 1642, and having pursued his studies in Rome from 1644 till 1652, settled at Amsterdam. There his style was greatly influenced by Wynants, in whose landscapes he often supplied figures and animals, and by Wouverman, whom he successfully imitated. He painted Italian seaports, landscapes, hunts, fairs, and other genre scenes, in a cool and often delicate silvery tone, and ranks high for skill in composition, good drawing, and careful execution. His pictures are to be found in almost every gallery of Europe. One of his principal works is the "Plan of a New Town Hall" (1656), in the City Hall at Amsterdam, noteworthy for the individual character of the numerous figures and the fine effect of the fresh morning light. In Amsterdam Museum are a rich "Italian Harbor" (1664), and a "Riding School," in which he rivals Wouverman. The "Italian Seaport" (1670), in the Hague Museum, and a "Vegetable Market" (1670) and "Seaport" in the Louvre are remarkable for a warmth of coloring quite unusual in this painter. The Städel Gallery in Frankfort contains a good portrait of him.

LINGENTHAL, lĭng′en-täl, ZACHARIÄ VON. See ZACHARIÄ VON LINGENTHAL.

LINGG, lĭng, HERMANN VON (1820—). A German dramatist and poet, born at Lindau. His *Poems* (1853) are of great elegiac originality and remarkable for their imagery. Much power appeared in his epic *Völkerwanderung* (3 books, 1866-68). He wrote also *Vaterländische Balladen* (1869), and other volumes of verse; the dramatic poem *Die Walkyren* (1864, 2d ed. 1865); the tragedy *Catilina* (1864), and other dramas. His latest poems are: *Jahresringe, Neue Gedichte* (1899); *Meine Lebensreise* (1899); *Schlussrhythmen und Neueste Gedichte* (1902).

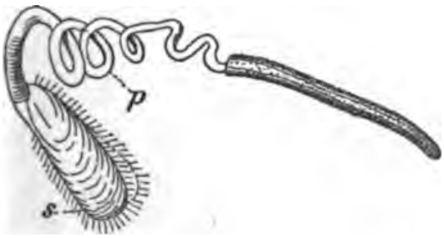
LINGUA FRANCA, lēn′gwȧ frän′kȧ (It., Neo-Lat., Frank language). A kind of corrupt Italian, with a considerable admixture of French words and idioms; spoken along the shores of the Mediterranean. Also applied to the commercial speech of the Levant, a mixture of native words and of elements from the languages of the Occident.

LIN′GUAGLOS′SA. A town of Sicily, in the Province of Catania, on the northeastern slope of Mount Etna, 1725 feet above the sea, and 37 miles from Messina (Map: Italy, K 10). Remains of the lava flow from the eruption of 1566 are to be seen here. The population (commune), in 1901, was 13,121.

LINGUET, lăN′gȧ′, Simon Nicolas Henri (1736-94). A French publicist, born at Rheims. He was in literary work for several years and then studied law and attained great success in his profession. But his attacks on the French Academy, which had refused him entrance, and quarrels with his brother lawyers, caused him practically to be exiled from France. He went to England, where he began to publish in London his *Annales politiques*, which under various changes of name he edited from 1777 to 1792 in Switzerland, Brussels, and again in London. For a time it received the support of the Austrian Government, as Linguet advocated many of the Emperor Joseph's reforms. He returned to France in 1780, and was confined in the Bastille for two years for his virulent attack on the Duc de Duras. While in prison he wrote his *Mémoires sur la Bastille* (1783). After this he went to Brussels, and remained there until the Revolution was almost over. But he returned too soon, and on the trumped-up charge of having "flattered the despots of London and Vienna," was guillotined in 1794.

LINGUISTICS. See Philology.

LINGULA (Lat., little tongue). A group of brachiopods, characterized by the possession of a shell, the valves of which are not hinged, but are connected by muscles, which open and close them by a more or less lateral movement; an oval opening is present near the anterior end of the animal; there is a long, fleshy stalk, which passes out from the rear between the valves of the shell. These brachiopods live in the seas of warm climates, particularly of the Indian Archipelago and Polynesia. An American species (*Glottidea pyramidata*) is common in Chesapeake Bay and off the coast of North Carolina. It has a shell about an inch long and half an inch wide; the stalk is two or three inches long. The valves of the shell are brown, very flat, thin, and horny. The outer end is broad, while the other end is much narrowed; the stalk comes from between the narrow ends. The living species of lingula occur only in rather deep water on muddy or sandy bottoms. Only seven or eight species are known to be living now, but the number of fossil forms is large. The genus Lingula has long been considered as the oldest known living organism, its shells having been found in all geological formations from those of late Cambrian to those of Pliocene time. The genus Lingulella flourished in the early Cambrian period. It thus presents an interesting case of the persistence of a type through countless ages with little evolutional change of the main stock. The species that occur in rocks of Ordovician age, when the type enjoyed the acme of its development, differ only slightly from the modern ones.



LINGULA.

A modern lingula: *s*, shell; *p*, peduncle or stalk, terminating in a tube of agglutinated sand-grains.

LINIERS Y BRÉMONT, lē′nē-ȧrs′ ē brā′-mônt, Santiago Antonio Maria de (1756-1810). A Spanish naval officer and administrator, born of French parentage at Niort, Deux-Sèvres. His name was originally Jacques Antoine Marie Deliniers-Brémont. His father was a loyalist sailor, and after the Revolution he entered the Spanish navy. He fought against the English under Admiral Beresford at Montevideo in 1806, and at the head of a small fleet forced Buenos Ayres to surrender in 1807. The people, who had been in sympathy with Liniers from the beginning, elected him Viceroy in the place of Sobremonte. The English now marched upon Buenos Ayres, and a desperate fight occurred before the city. After making great havoc in the enemy's lines, Liniers retired into the city, and defended it so successfully that the English finally evacuated the valley of the Rio de la Plata. He was requested to leave the country, and was replaced as Viceroy by Cisneros. The revolution that promptly followed these events forced Liniers to take up arms again for the Royalists. He raised a small army and marched on Buenos Ayres, but he was captured and executed with several of his army.

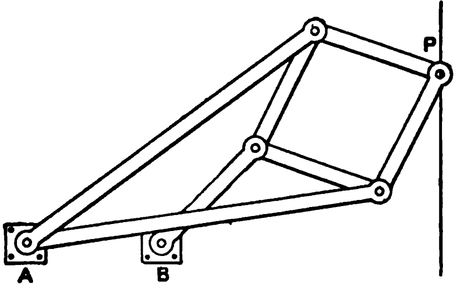
LINIMENT (Lat. *linimentum*, from *linire*, to smear). A fluid preparation for external application, generally having soap or some fatty substance as a basis. A liniment is, physically, an ointment having the consistence of oil; chemically a soap—that is to say, a compound of oil and an alkali. In consequence of their slighter consistence, liniments are rubbed into the skin more readily than ointments. Among the most important of them are: *Liniment of ammonia*, which is prepared by mixing and shaking together spirits of ammonia and olive oil, and is employed as an external stimulant and rubefacient to relieve neuralgia and rheumatic pains, sore throat, etc.; *Soap liniment*, or *opodeldoc*, the constituents of which are soap, camphor, and spirits of rosemary, and which is used in sprains, bruises, rheumatism, etc.; *Liniment of lime*, or *carron oil*, which is prepared by mixing and shaking together equal measures of olive or linseed oil and lime-water; it is a soothing though very dirty application to burns and scalds, and from its general employment for this purpose at the Carron Iron Works, England, has derived its popular name; *Camphor liniment*, consisting of camphor dissolved in olive oil, which is used in sprains, bruises, and glandular enlargements. Other official liniments mentioned in the United

States Pharmacopœia are the liniments of belladonna, cantharides, chloroform, subacetate of lead, mustard, and turpentine, or *Kentish ointment*.

LI′NIN (from Lat. *linum*, flax). The thread-like achromatic network forming the protoplasmic basis of the plant nucleus.

LINK, Heinrich Friedrich (1767-1851). A German botanist, born in Hildesheim. He studied medicine and natural science in Göttingen, and in 1792 became professor of chemistry, zoölogy, and botany at the University of Rostock. He visited Portugal in 1797 in company with Hoffmansegg, and in 1811 he became professor of chemistry and botany at Breslau. In 1815 he became professor of natural history and the director of the Botanical Gardens in Berlin. His works include: *Elementa Philosophiæ Botanicæ* (1824); *Das Altertum und der Uebergang zur neuern Zeit* (1842); *Anatomisch-botanische Abbildungen zur Erläuterung der Grundlehren der Kräuterkunde* (1837-42); *Ausgewählte anatomisch-botanische Abbildungen* (1839-42); and *Anatomie der Pflanzen in Abbildungen* (1843-47).

LINKAGES (from *link*, AS. *hlence*, Swed. *länk*, Norweg. *lænk*, link; connected with OHG. *hlanca*, *lanca*, provincial Eng. *lank*, groin, and probably with AS. *hlanc*, Eng. *lank*, slim). A system of segments or links pivoted together and capable of moving so as to describe various curves; e.g. Watt's parallel motion (1784) employed in beam engines is a case of a link motion in which the outer extremities of the end links are fixed, and the mid-point of the middle link approximately describes a straight line. Roberts and Tchebitcheff improved Watt's instrument by varying the form of the links, but Peaucellier (1864) was the first to produce an ideally straight line. His linkage known as Peaucellier's cell consists of seven links as shown in the figure. A, B are the fixed point, and P is the tracer which moves in a straight line. This achievement is not only of interest to the mathematician, but of great use to the engineer in securing parallel motion. Sylvester invented the *plagiograph* or skew pantagraph, which not only reproduces a drawing to a desired scale, but turns it through any desired angle. Hart's contra-parallelogram and Kempe's angle trisector are other important linkages. Consult Kempe, *How to Draw a Straight Line* (London, 1877). For the mathematical theory of linkages, consult "Sur les systèmes de tiges articulées," in *Nouvelles Annales* (1875, pp. 520-560).



LINKÖPING, lĭn′chẽ′pĭng. An episcopal city of Sweden, capital of the Læn of Ostergötland, situated on the Stångå, which here flows into Lake Roxen, 110 miles southwest of Stockholm (Map: Sweden, G 7). It is regularly built with fine parks and public squares; its cathedral is one of the most beautiful in Sweden. It also possesses one of the largest libraries in the country, and several higher educational institutions. The town manufactures chiefly tobacco. Population, in 1901, 14,552. Linköping has been an important town since the early Middle Ages. In 1598 it was the scene of the defeat of the Catholic forces of Sigismund of Poland by his uncle, later Charles IX.

LINLEY, lĭn′lĭ, Thomas (1732-95). An English composer, born at Wells. He studied at first under the celebrated Chilcot, organist of the Abbey at Bath, and later at Naples under Paradies. Upon finishing his studies he settled in Bath, teaching music and giving concerts, at which the principal attraction was the singing of his two daughters. Later he removed to London in order to conduct oratorios, first in connection with Stanley, then with Dr. Arnold. The success of Sheridan's *The Duenna* in 1775 was largely due to the music of Linley, and the following year the two formed a partnership and purchased an interest in the Drury Lane Theatre, Linley having direction of the musical interests, which position he held for twelve years. Among his compositions, *The Carnival of Venice* and *Selima and Azor* were produced at Drury Lane, and may be counted his most important works. He was also a well-known composer of ballads and madrigals, the best known being his music for the song in the *School for Scandal*. His death, which occurred in London, was precipitated by grief caused by the drowning of his son, Thomas.

LINLEY, William (1771-1835). An English composer and author, son of Thomas Linley (q.v.). He was born at Bath, educated at Harrow and Saint Paul's schools, and for several years was in the service of the East India Company at Madras and Calcutta. He early returned from India and devoted the remainder of his life to literature and music. He published a number of glees, a set of songs, two sets of canzonets, and many detached pieces, and compiled *Dramatic Songs of Shakespeare* in two folio volumes, in which are several of his own elegant compositions. He also wrote two novels, and two comic operas, performed at Drury Lane.

LINLITHGOW, lĭn-lĭth′gō, or West Lothian. A county in the southeast division of Scotland, bounded north by the Firth of Forth, and having the counties of Mid-Lothian, Lanark, and Stirling on the east, south, and west, respectively (Map: Scotland, E 4). Its area is 120 square miles. Agriculture is in a very advanced state. The minerals are of considerable value, and there are several collieries in profitable operation. There are two royal burghs—Linlithgow, the county town, and Queensferry. Population, in 1801, 17,850; in 1831, 30,100; in 1901, 65,700.

LINLITHGOW. The capital of Linlithgow County, Scotland, 16 miles west of Edinburgh (Map: Scotland, E 4). It is one of the oldest towns in Scotland, and has the parish church of Saint Michael's, a beautiful specimen of late Scottish Gothic, adjoining Linlithgow Palace. The palace, strikingly situated on an eminence, was a residence of the Scottish monarchs, and the birthplace of Mary, Queen of Scots, and of her father, James V. The earliest record of its existence is of the time of David I. (1124-53), and fragments of various ages are easily detected. Linlithgow was conspicuous in Scotch history, and here the Regent Murray was murdered in 1570. Population, in 1891, 4150; in 1901, 4279. Consult Waldie, *History of Linlithgow* (3d ed., Linlithgow, 1879).

LINN. Various species of the genus Tilia. See LIME-TREE.

LINNÆAN SOCIETY OF LONDON. A British scientific society, founded in February, 1788, by Sir James Edward Smith, a leading botanist, who bought from the executors of Linnæus his library, manuscripts, and natural history collections. It was incorporated by royal charter in March, 1802. The society annually awards a gold medal, alternating between a botanist and a zoölogist. The papers read at the fortnightly meetings are published in expensive illustrated quarto "Transactions" and octavo "Journals." The headquarters of the society are at Burlington House.

LINNÆUS, CAROLUS (1707-78). The generally used Latin name of Karl von Linné, the great Swedish naturalist, who is chiefly thought of as the originator of the modern nomenclatorial methods as applied to plants and animals, but is to be regarded in a broader sense as the forerunner of the modern systematists.

He was born in Råshult, in the Province of Småland, Sweden, in May (old style), 1707. His father, Nils Linné, was at that time a Lutheran vicar, who in 1709 became pastor. His mother was Christina Broderson, daughter of the previous incumbent in the pastorate. The antecedents of Linnæus thus account for the desire which prompted and directed the efforts of his parents, in spite of their narrow circumstances, to give him the proper education for the ministry. Nevertheless, it would seem that Nils Linné unconsciously gave a trend to the young mind of his first-born which may account for the direction which it afterwards took in the man; for the pastor was an intelligent gardener, partly for the love of it and partly from necessity, and Linnæus wrote of his father: "He was an uncommon lover of rarities, and had a select garden of uncommon plants."

When the future naturalist was four years of age, it appears that, in spite of his tender years, he was unusually inquisitive in regard to plants. When he reached the age of eight, he was assigned a garden spot of his own, and showed much energy in implanting all manner of wild growths. Certainly within these early childish years Linnæus had begun his course as a naturalist; for his love of collecting and habits of observation did in his case what they have in many another—they absorbed his real interest, while his regular tasks were performed more or less perfunctorily. It was fortunate for the boy's peace of mind that his first schoolmaster, Lanærius, in the school at Wexiö, to which he was sent in 1717, was himself fond of botany, and encouraged the boy in his botanizing. After seven years of the gymnasium he passed into the college in the same town, but his academic behavior so ill satisfied his father that he became disturbed for the young man's future. Though Linnæus expressed his willingness to conform to his father's wishes and enter the ministry, he pleaded that he should be allowed to follow his own inclination. The father, however, urged by others who regarded Linnæus unfavorably, determined to apprentice him to a tradesman. From this fate, however, he was rescued through the intercession of Rothmann, a physician of the town of Wexiö, who, recognizing Linnæus's industry and ability, directed his studies in physiology and supplied him with books on botany and medicine. Rothmann, in whose house he was at that time living with his father's consent, had the rare experience of bringing a young man to his life-work; and this circumstance illustrates most strikingly the wisdom of directing the young mind into its natural channels. After being with Rothmann, Linnæus went (1727) to Lund, where he furthered his studies under Dr. Kelian Stobæus for a year, after which he went, on Rothmann's advice, to Upsala, where the renowned Rudbeck was teaching. Stobæus seems to have been offended at this, since he was not consulted in regard to the change. The young man arrived at Upsala with little money, and no prospect of self-support, which was the first consideration. While in this state of uncertainty he was one day examining plants in the garden of the university, when Dr. Celsius, a physician and botanist, met him, and shortly afterwards engaged him as an assistant in compiling a treatise on the plants of the Bible (*Hierobotanicon*), giving him a home in return, and by recommendations enabling him to get opportunities to give private instruction. While with Celsius he became interested in Vaillant's *Sermo de Structura Florum* (Leyden, 1718) and in Wallin's *Gamos Phyton* (Upsala, 1759), the study of which led him to the writing of an essay on the sexes in plants. This essay served to recommend him to Rudbeck, to whom he was favorably introduced by Celsius. This introduction led to his appointment as Rudbeck's adjunctus, at the same time being appointed to direct the garden in which he would gladly have become a gardener the year previous.

On May 12, 1732, he set out on an exploration of Lapland, carrying his whole outfit on his back. The cost of the journey ($125), which covered upward of five thousand miles, was defrayed by the Academy of Sciences of Upsala. His botanical results were published in his *Flora Lapponica*, which appeared five years later. An account of this journey is contained in the *Lachesis Lapponica*, which was translated in 1811 by J. E. Smith, the first president of the Linnæan Society of London, by whom also the Linnæan collections and library were purchased in 1783. On his return from Lapland he made a scientific journey through Dalecarlia at the invitation of the Governor. While at Fahlun, where he attracted large numbers of people to some public lectures, he met the woman who afterwards became his wife, namely, Sara, the daughter of Dr. Moré (Moræus), under whose patronage he went to the Netherlands to study for his degree in medicine. This he received in 1835 at Harderwijk. It was in this year that Linnæus published his *Systema Naturæ*, it being sent to the press at the expense of Dr. Gronovius, who at once recognized its value. This paper, the first edition of which consisted of eight folio sheets, ran through twelve editions, at the same time being expanded.

After obtaining his degree he came under the patronage of John Clifford, a banker of Amsterdam, who had a large garden at Hartecamp.

His studies of Clifford's plants appeared as the *Hortus Cliffortianus*. Linnæus stayed in Holland till 1739, and during his residence here wrote, besides the works mentioned above, his *Fundamenta Botanica, Bibliotheca Botanica* (both 1736), *Critica Botanica, Genera Plantarum* (both 1737), and his *Classes Plantarus* (1738). During this time also his scientific and influential acquaintance and his reputation increased very widely, so that, on prosecuting a journey to France and England he received considerable though, in different places, unequal attention and recognition.

Returning again to the Netherlands he spent some time in the garden of Van Royen in Leyden. After his recovery from an illness through which he was tended by Clifford, he settled down to the practice of medicine at Stockholm, where, being comparatively unknown, he had little practice. He gained at length the appointment of Naval Physician (1739), and was at this time enabled to marry. He was honored in Stockholm by the presidency of the Academy. In 1741 he was appointed professor of medicine in the University of Upsala, at which time also Rosen was appointed to the chair of botany. During this year Linnæus made a scientific tour of Öland and Gothland, the scientific results of which were published as "Oländska ach Gothländska Resa" in 1745. In this paper popular names were first used. In the year following, 1742, Linnæus and Rosen exchanged their offices to their mutual advantage and satisfaction, and this circumstance marks the beginning of his career as teacher and student which was free from care and uncertainty, and in which he reaped the reward of his previous diligence and perseverance. Until 1778, a period of 37 years was spent in teaching, study, and writing. Students crowded to the university to hear him; the many whom he won to the science of natural history went all over the earth in search of materials, and specimens poured into his hands from all quarters. His reputation became unique and world-wide. During this time, in addition to the revised editions of his previously published works, he wrote the famous *Philosophia Botanica* (1751), *Flora Suecica* (1745), *Fauna Suecica* (1746), *Hortus Upsaliensis* (1748), and the *Species Plantarum* (1753), in addition to other papers on Materia Medica. His *Philosophia Botanica*, and especially his *Species Plantarum*, have been truly regarded as epoch-making, as may be judged from the fact that in 1892 the systematic botanists in convention at Rochester formally adopted the date of publication of the *Species Plantarum* as the starting-point for modern nomenclatorial rulings. The Linnæan system is still widely used in the schools of Germany, although superseded by more natural systems for general uses.

In 1761 he received the title of nobility, dated back to 1757, and was thereafter known as Carl von Linné. In 1767, at the age of sixty, his remarkable memory began to fail. From 1774 to the time of his death, on January 10, 1778, he suffered greatly as the result of apoplexy, having had no use of his right side for two years before he finally succumbed. He was buried in the cathedral at Upsala.

It is impossible within the limits of a brief biographical sketch to do justice to this great man, for he more than any other has influenced modern systematology. He was the first to use a binomial nomenclature, although his use of it did not correspond to the present method. With Linnæus the specific name stood in the margin and had indexical value, while the generic name stood at the head of the description. His descriptions were stripped of all unnecessary words, and under his skill became terse diagnostic statements of pertinent characters. The system which consisted in the classification of plants, according to the number of stamens and pistils, was avowedly artificial, but was used by Linnæus to get order out of chaos.

LINNÉ, lĕn'nā', Karl von. See Linnæus, Carolus.

LIN'NELL, John (1792-1882). An English landscape and portrait painter. He was born in London. At the age of twelve he became a pupil of Benjamin West, and later entered John Varley's studio, where he learned more from Mulready, a fellow-pupil, than from his master. He first exhibited at the Royal Academy in 1807. The same year he received a medal at the Royal Academy for a drawing from the life, and in 1809, at the British Institution, the prize of fifty guineas for the best landscape. During the early part of his career he painted good portraits, but it was in landscape work that he won renown. His pictures are, for the most part, in public and private collections of England. In the National Gallery are his "Wood-Cutters" and the "Windmill." Among other works are "Christ's Appearance to His Disciples on the Road to Emmaus," "Eve of the Deluge," "Under the Hawthorn," "Sleeping for Sorrow," and "The Hollow Tree." He executed many miniatures on ivory, and was an engraver of some note. He died at Redhill, January 20, 1882. His two sons, James Thomas and William L., also landscape painters, inherited much of their father's talent.

LINNET (AS. *linete*, OF., Fr. *linot*, linnet, from Lat. *linum*, flax; so called from their feeding on flaxseed). A finch of the genus Linaria, or some near relative. The size is small, the tail forked, and the colors brown mixed with white, and more or less flushed with crimson, especially in the spring dress of the male. All belong to northerly regions. The linnet (*Acanthis*, or *Linaria, cannabina*) is well known through Europe and Northern Asia. In its winter plumage its prevailing color is brown, the quill and tail feathers black with white edges; in the nuptial plumage the crown of the head and the breast are bright vermilion color, and a general brightening of color takes place over the rest of the plumage. This change of plumage causes it to be designated by fanciers as brown, gray, or rose linnet, according to the season of the year and the sex. It is the *lintie* of the Scotch. The sweetness of its song makes it everywhere a favorite. It sings well in a cage, and readily breeds in confinement, but the brightness of the nuptial plumage never appears. The linnet abounds chiefly in somewhat open districts, and seems to prefer uncultivated and furze-covered grounds. Its nest is very often in a furze-bush or hawthorn hedge, and is formed of small twigs and stems of grass, nicely lined with wool or hair; the eggs are four or five in number, pale bluish white, speckled with purple and brown. Linnets congregate in large flocks in winter, and in great part desert the uplands, and resort to the seacoast. In the Eastern United States the name is sometimes given to the redpolls (q.v.) and to the purple finch (*Carpodacus purpureus*), a handsome bird over six inches long. The male in full plumage has the head and anterior parts of the body rose-purple, in the same manner as the true linnet. The female is plain brown, much streaked. See CAGE-BIRDS, and the illustrations and authorities cited thereunder.

LINOLEUM (Neo-Lat., from Lat. *linum*, flax + *oleum*, oil). A peculiar preparation of linseed oil in which the latter is so treated that it becomes solid. This was first accomplished by using sulphur, but it was subsequently ascertained that the same effect could be secured by mere oxidization. Oil so treated is useful for many purposes. As a paint, it may be employed on iron, on wood, and on ships' bottoms. When used as a cement it possesses some of the useful properties of marine glue. When vulcanized or hardened by heat it may be filed, planed, turned, carved, and polished like wood, and used for knife and fork handles, moldings, etc. When brought by certain processes to the consistency of dough or putty, it may be pressed into embossed molds for ornamental articles.

The floor-covering known as linoleum is made by mixing the linoleum cement with ground cork. The cork used is chiefly the waste from the manufacture of bottle-corks. (See CORK.) The linoleum cement is prepared by pouring successive layers of boiled linseed oil over a thin cotton fabric called *scrim*, which is allowed to dry thoroughly between the applications of the oil. The operation of drying takes about twenty-four hours, and the oil is applied daily for six or eight weeks. By this time the oxidized oil is about one-half an inch thick and is called a skin. These skins are cut down and ground between rollers and then thoroughly mixed with resin and kauri gum. The powdered cork is next added, and if the linoleum is to be plain, coloring matter is also added. This mixture is then applied to jute burlap and the fabric passed between rollers to even off the surface. The pattern is printed in the same manner as upon oilcloth (q.v.). Consult *History and Manufacture of Floor Cloths* (New York, 1898).

LINOTYPE. See TYPESETTING MACHINES.

LINSANG (East Indian name). (1) A small, cat-like viverrine or civet (q.v.) of the genus Prionodon or Linsang, inhabiting the Oriental region. The claws are quite retractile, and the feet furry, like a cat's; and there is no second upper molar. Three species exist in the Malay Peninsula and islands, of which *Prionodon particolor* is best known. It is grayish, profusely marked with large black spots and stripes. It is equally at home in trees or on the ground; feeds principally upon birds; and bears two young, once in six months, in a den in a hollow tree.

(2) A very similar animal (*Poiana Poënsis*) of Fernando Po, West Africa. This animal, however, resembles a genet in behavior.

LINSEED (AS. *linsæd*, flaxseed, from *lin*, flax + *sæd*, seed). The seed of the *Linum usitatissimum*, or flax-plant. In America flax is grown almost wholly for the seed. It is chiefly raised in the Middle West, where it is sown broadcast in the spring, on new land prepared as for wheat or oats. It is harvested and threshed by machinery. (See FLAX.) The seeds are raised both for the oil and for the oil cake which they produce. Like all other vegetable oils, linseed oil is produced in two ways: by simple pressure, and by pressure combined with heat. There is, in addition, a newer process, in which the oil is extracted by gasoline or some other solvent. The cold-drawn oil is a pale, tasteless liquid. It is used in Russia and Poland as a substitute for butter. The ordinary linseed oil of commerce is an amber-colored liquid, of a disagreeable taste and odor, largely used in the manufacture of paints, varnishes, and in oilcloth, linoleum, and similar fabrics. When boiled, either alone or in combination with white lead or litharge, it dries much more rapidly on exposure to the air than the unboiled oil. See OILS; LINSEED MEAL; and OIL CAKE.

LINSEED MEAL. Often called 'oil meal' in the United States. The residue from the separation of linseed oil from flaxseed. It is of two classes, distinguished as old-process and new-process linseed meal. In the old process the oil is expressed, and the residue is in the form of hard cakes, which are either sold as oil cakes or linseed cake, or ground to a meal. In the new process the linseed oil is more thoroughly removed with the aid of solvents, hence the meal contains less fat, but correspondingly more protein. Both kinds are on the market. The difference in composition is shown by the following averages: Old-process linseed meal—water, 9.2 per cent.; protein, 32.9; fat, 7.9; nitrogen-free extract, 35.4; fibre, 8.9; and ash, 5.7 per cent. New-process linseed meal—water, 9.9; protein, 35.9; fat, 3.0; nitrogen-free extract, 36.8; fibre, 8.8; and ash, 5.6 per cent.

Linseed meal is a highly prized feeding stuff for calves, fattening cattle, milch cows, horses, and other animals; but on account of its richness it should be fed only in small quantities. A large proportion of the meal produced in this country is exported to Europe.

LINTEL (OF. *lintel*, Fr. *linteau*, from ML. *lintellus*, lintel, diminutive of Lat. *limes*, threshold). The horizontal bearer over doors, windows, and other openings in walls, usually either of stone or wood, but sometimes of iron. It is a short architrave, and it may also be cut in the mass in arch shape.

LINTH, lint, ESCHER VON DER. A Swiss statesman. See ESCHER VON DER LINTH, HANS KONRAD.

LINTON, lĭn'ton, ELIZA LYNN (1822-98). A novelist, wife of William James Linton (q.v.). She was born at Keswick, Cumberland, England, February 10, 1822. A series of papers contributed to the *Saturday Review*, under the title "The Girl of the Period," attracted wide attention. They were collected and published independently in 1883. Mrs. Linton wrote many novels. *The True History of Joshua Davidson* (1872) and *The Autobiography of Christopher Kirkland* (1885) are representative of her best work. She died in London July 14, 1898. Consult *My Literary Life*, published posthumously (London, 1899), with prefatory note by Beatrice Harraden.

LINTON, Sir JAMES DROMGOLE (1840—). An English painter, born in London. He studied at Saint Martin's Art School and under Leigh. His early works were in water-color, and he did much to spread the interest in that branch of painting. He was elected president of the Royal

Institute of Painters in Water-Color in 1884, when that society was reorganized, and held this position until 1899. After 1878 he worked in oil, and his subjects were mainly genre or historical. Among the latter is "The Marriage of the Duke of Albany" (1885).

LINTON, William James (1812-97). A wood-engraver and author, born in London, December 7, 1812. He learned his art from G. W. Bonner, to whom he was apprenticed in 1828. In 1842 he became the partner of John Orrin Smith, a distinguished wood-engraver, with whom he was employed on the *Illustrated London News.* As a young man he was a zealous Chartist, and continued through life a stanch defender of republicanism and the rights of workmen. For promulgating his ideas he founded, in conjunction with Thornton Hunt and George Henry Lewes, the *Leader,* a daily (1850), but gave up his position after a few weeks. The next year he started the *English Republic,* a monthly magazine aiming to explain republican principles. He also contributed articles on social questions to the *Nation* (the Irish patriotic paper), the *Westminster Review,* the *Examiner,* and the *Spectator.* As a wood-engraver he is best known, especially for the weekly engravings contributed to the *London News* and the *Masters of Wood-Engraving* (1890). Among his numerous publications are: *Claribel and Other Poems;* lives of Thomas Paine and of John Greenleaf Whittier; *Poems and Translations;* and *Rare Poems of the Sixteenth and Seventeenth Centuries.* With R. H. Stoddard, he edited *English Verse* (1883). In 1858 Linton married Eliza Lynn, the well-known novelist. She furnished the letter-press to his plates in *The Lake Country* (1864). The marriage proved uncongenial, and Linton came to the United States in 1866, where he lived during the rest of his life. He died near New Haven, Conn., December 29, 1897. Consult Linton's interesting literary autobiography, *Three Score and Ten Years: 1820-90: Recollections* (London, 1894).

LIN TSEH-SÜ, lĭn′ tsă′ sōō′ (1785-1850). A Chinese high official who attained international notoriety as 'Commissioner Lin.' He was born in the Province of Fu-kien, and until he was seventeen years old assisted his father as a maker of artificial flowers. Aided by a wealthy friend, whose daughter he married, he became a student, successfully passed the different examinations leading to the doctorate, in 1811 received the degree of *Chin-shih,* the highest in China, and was made censor. He rose rapidly through various grades of provincial service, and became Governor-General of Hu-nan and Hu-peh in 1837. Here he suppressed the opium traffic with such vigor that, in 1838, he was sent to Canton to deal with the opium situation there. Lin's zeal outran his discretion, and his attitude toward the foreigners themselves, as well as his arbitrary seizure and destruction of eleven million dollars' worth of opium, and other high-handed acts, led to the so-called 'Opium War' with Great Britain. In 1839 he became Governor-General of the two Kwang provinces, but as his relations with the British Government representatives became more and more unsatisfactory, the Emperor recalled him to Peking in 1841. He was at first transferred to a subordinate position in Sheh-kiang, but in 1843, when the full extent of his bungling at Canton was made more apparent, he was banished to Ili (Kulja), where he was engaged in reclaiming marshes and waste lands in various parts of Sungaria and Eastern Turkestan. At the end of 1845 he was recalled, became acting Governor-General of Shen-kan, Governor of Shan-si in 1846, Governor-General of Yun-kwei in 1847, and on the outbreak of the Taiping rebellion in Kwang-si was made acting Governor of that province. Three years afterwards, while on his way to attack the rebels, he died. A patriot of ability, but lacking in statesmanship, he was opposed to the opening of the country. Feeling the need of a better knowledge of foreigners, he collected much material for a geography of the world. This was given to another hand, also anti-foreign, and in 1844 his great *Geography* was published in 50 books.

LINUM (Lat., flax). The genus of about seventy-five species of plants common to temperate and subtropical regions, of which common flax (*Linum usitatissimum*) is the most important species, such other species as are cultivated being esteemed not for their fibre, but for ornament. Among these is the perennial flax (*Linum perenne*) of the Western States, which attains a height of 18 inches, with tufts of slender stems surmounted by delicate blue flowers. *Linum grandiflorum,* a red-flowered annual species, is a common garden plant. *Linum Berlandieri* is a yellow-flowered species growing in Texas and adjacent regions.

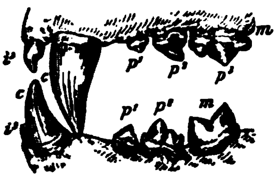
LI′NUS, second Bishop of Rome (69-79?). The Linus to whom Paul sent greetings (II. Tim. iv. 21). Irenæus (*Adv. Haer.,* iii. 3), in the latter half of the second century, says that "Peter and Paul, when they founded and built up the Church of Rome, committed the office of its episcopate to Linus." Eusebius, in the first half of the fourth century, followed by Theodoret in the fifth, Baronius in the sixteenth, and Tillemont in the seventeenth, states that Linus became Bishop of Rome after the death of Peter.

LINUS (Lat., from Gk. *Λίνος*). A personification of lamentation, called the son of Apollo and a muse or of Amphimarus and Urania. He was the subject of various legends, especially at Argos and Thebes, and is said to have been slain by Apollo for contesting with the god in music. A later Linus was slain by Hercules. He was worshiped near Mount Helicon with annual sacrifices and dirges (lini). The origin of the name is in doubt.

LINZ, lĭnts. The capital of the Crownland of Upper Austria. It is situated in a pleasant district on the right bank of the Danube, which is crossed by an iron bridge, connecting Linz with Urfahr, 117 miles by rail west of Vienna (Map: Austria, D 2). It is a strongly fortified, quiet town with two suburbs, Lustenau and Waldegg. The principal buildings are the cathedral (1670), the municipal parish church (1286), the castle, now used as an armory, and a museum, with a library. Linz has a trade in machinery, wagons, leather, beer, and tobacco. It has also a shipyard, a State tobacco factory employing 1000 hands, and a Chamber of Commerce. The city is well supplied with educational institutions and hospitals, and has a deaf and dumb institute, and a library (38,000 volumes). Steamboats daily ply up the river to Ratisbon, and down to Vienna. Population, in 1890, 47,685; in 1900, 58,778. Linz was the Roman camp *Lentia.*

LINZ, Amelie (1824-1904). A German author, born at Bamberg. She married an officer of engineers, and four years after his death (1870) settled at Munich. Her literary work, published under the name Amélie Godin, includes the novels: *Eine Katastrophe* (1862); *Frauenliebe und Leben* (1874); *Gräfin Leonore* (1882); *Freudvoll und leidvoll* (1883); and *Dora Reval* (1901); and several collections of fairy-tales, such as *Märchen von einer Mutter erdacht* (4th ed. 1860); *Grosses Märchenbuch* (4th ed. 1886); *Märchenkranz* (2d ed. 1896); and others.

LION (AS. *lēo*, OF. *lion*, *leon*, Fr. *lion*, It. *leone*, *lione*, from Lat. *leo*, from Gk. *λέων*, *leōn*, lion). The most famous of the great cats (*Felis leo*), and distinguished from all others by its mane and the hairy tuft at the end of the tail. It inhabits Africa and Southwestern Asia. A lion of large size stands three feet high, and measures about nine and one-half feet from the nose to the tip of the tail, which is about three feet long; but most specimens fall short of these figures. The greatest size seems to be attained in South Africa. The weight rarely reaches 500 pounds. The skull of an adult may measure 13 inches in length, and 9½ inches in breadth across the cheek-bones. In accordance with its desert life, its color is a uniform pale tawny, sometimes reddish, and occasionally almost black. Though never streaked or spotted, the mane is frequently darker than the coat, or even diversified with blackish patches. Kittens are obscurely spotted and striped at first, as is the case with other concolorous species of groups generally spotted, but this disappears after a few months. The lioness is somewhat smaller than the lion, and has no mane—nor have young males. Sometimes they never acquire more than a scanty ornament of this kind, but the so-called 'maneless lion of Gujarat' seems not to exist as a separate race. There is, however, great diversity in this feature, as in color, even within the same litter. The mane is evidently a sexual ornament, and also a shield, which offers some protection to the males in the combats which occur in this species more frequently and with more fierceness than in the case of any other wild cat of which we know. The whole frame is extremely muscular, and the fore parts in particular are remarkably powerful, giving, with the large head and copious mane, a noble appearance to the animal, which, with its strength and its appalling voice, has led to its being called the 'king of beasts.' The accompanying nobility of character which has been ascribed to it by Buffon and his followers seems, however, largely fanciful.



TEETH OF THE LION.

Permanent dentition: *i*, incisors; *c*, canines; *p*, premolars; *m*, molars. In the upper jaw p^3 is the upper carnassial, and in the lower jaw *m* indicates the lower carnassial tooth.

Habitat. In the time preceding the Glacial Epoch, lions, indistinguishable by their remains, entombed in the floors of caves, from modern forms, roamed over all Southern Europe, Germany, France, and the British Isles. They seem to have been exterminated in the North and West by the glacial cold, but survived in Southeastern Europe well into historic times, for the Romans knew of them anciently in what is now Rumania, Greece, and European Turkey; and still more recently they have existed in Syria and Arabia. These animals probably were driven away by man. They were also formerly numerous from the Caucasus to Afghanistan and Baluchistan; but are now scarce and local in Asia, extinct in Asia Minor, Arabia, and Egypt, and have nearly or quite disappeared from Algeria.

In Asia they were formerly abundant on the sandy wastes of Rajputana and the high plains of Persia, but now have almost or quite disappeared from India, and are confined to the swampy lowlands of the Tigris and Euphrates valleys, and certain valleys east of the Persian Gulf; in Africa they are to be found in the naked deserts of the Southern Sahara, the Kalihari Desert, and the Abyssinian regions, as well as among the rough hills of Mashonaland and the dense swamps of the Upper Nile tributaries. Everywhere, during the day, they are likely to hide and sleep in secluded clusters of brush-grown rocks, thickets of thorny bushes, or patches of reeds or tall grass with the color of which their yellow coats are perfectly in accord. It is in such haunts and in the spring that the whelps are born. Usually there are three young, and rarely are more than five produced. They are born with their eyes open (the pupils are round). Although during the pairing season the lioness apparently delights in provoking jealous combats for her favors, by which the weaker members of the race are continually 'weeded out' and only the strongest survive to produce offspring (see Sexual Selection), she makes a devoted mother, and the male stays with his family and assists in supplying their wants until the young are well grown. It is said that old lions of unusual strength are often polygamous; and it is also asserted that ordinarily the same mates keep together for several successive seasons, or for life. Probably both assertions are true; likely it is also true that other pairs change annually. Where the animals are or were very numerous, polygamy and frequent change of mate would be likely to happen more often than where they were few and the range of choice correspondingly limited. No young lion can get a mate, nor an old one keep her, where others are about, except by fighting.

Where lions have not been much disturbed by guns they are likely to be seen abroad and hunting in the daytime, sometimes in small family troops, but elsewhere, and generally, they prowl and hunt at night. Though able to gallop swiftly for a short distance, their weight and their feline nature incline them to adopt stealthy approach or ambush in their hunting. They are unable to climb trees, but are nimble enough in scrambling about rocks. Knowing the habits of the animals they seek, they wait beside their paths or at their drinking-places, or skillfully stalk them in the open, depending as much, probably, on their eyesight as on their faculty of scent. What they eat depends upon where they live. In India deer, antelopes, wild boars, and lesser wild animals are largely supplemented by domestic or semi-domestic cattle, goats, pigs, ponies, camels, and an occasional Hindu. In Mesopotamia the lions would greatly decrease or starve were it not for the large herds of half-wild pigs that range the oak forests east of the Persian Gulf. In Africa their great numbers were correlative with the hordes of game with which that continent was frequently overrun, and the disappearance of this game means the doom of the 'king of beasts,' unless cattle replace the wild grazers. The elephant, rhinoceros, and hippopotamus are beyond its powers, and the buffalo is able to resist a single lion, as a rule, though frequently pulled down by two or three acting in concert. The larger antelopes and equine animals are the lion's natural and constant prey, and it seems to prefer the latter—the zebras and wild asses. These animals, however, keep in the open plains, are quick to perceive and swift to escape intended attack, and in the days when game was abundant most lions fed mainly on antelopes. Even here, however, they had not always an easy victim. Schulz, who gives an unusual amount of information as to the Central African lion in his *New Africa*, says that this beast does not dare attack roan and Harris's antelopes in his usual manner, a leap from behind to the haunches, "for with their backward sweeping horns they are able to make things lively for any lion foolish enough to make the attempt. These, with hornless game, such as the quagga, they seize by the nose."

The method of attack has been described in so many ways by creditable hunters and native observers, that it is evident no one method exists, but if the first lightning-like leap and overbearing stroke does not crush the animal, the nose may be seized in a paw and the head jerked back, breaking the neck; or the great blood-vessels of the throat may be gnawed open, or the animal simply be mauled to death. It is customary for the lion, like other great cats, to carry or drag its prey into a thicket or near its lair before feeding upon it, and under the excitement of being disturbed and chased it is capable of extraordinary feats of strength in so doing, but these seem to have been exaggerated. That he can drag a large animal a considerable distance is undoubted. Having killed his prey, he eats at once what he wants of it. If other lions have helped him, they get what they are able to take. When they are satisfied, any lioness or young lions near by get such shares of what remains as their agility and courage enable them to seize.

Wherever settlements are made in a district infested by lions, these animals profit by raids upon domestic animals; and the scarcer the wild prey becomes, and the more familiarity the lions acquire with man and his ways, the more harm they do. Few fences or stockades are effective against them. The next step is the habit of occasional or persistent preying upon humanity. How the lion of the wilderness behaves in the presence of man depends upon such a diversity of circumstances, and so varies with individuals, that it is not safe to generalize. If he is not hungry and has a free way for retreat, he will very likely run when a man is met; but he may charge on the instant. A few brought to bay have been known to cower, but the majority fight for life bravely. Occasionally certain lions, like tigers, get into the habit of deliberately seeking human flesh. They are often old, weakened ones, no longer capable of hunting well, but sometimes are individuals, wiser than the ordinary, who have learned that humanity is the easiest possible prey. Such animals must be got rid of, and in Africa large parties are organized to hunt them down and kill them—an achievement rarely accomplished without further loss of human life.

The hunting of lions is done nowadays almost altogether on foot, by lying in wait at night at their drinking-places, or by seeking them by day in their lairs. The literature of sport in Africa, Persia, and India abounds in thrilling tales of adventures thus encountered. Various traps have always been used for their capture, the most successful of which is the pitfall, and by this means principally were captured the great numbers of lions familiar to the civilized people of antiquity.

This imposing animal, we are told, makes its appearance in art and literature very early. Frequent mention is made of it in the cuneiform tablets and Hebrew Scriptures. In the so-called *Song of Pentaur*, describing the war of Rameses II. against the Cheta, lions are said to have accompanied the King's chariot. They were kept in all the Roman cities for the public sports, and hundreds were sometimes provided for the entertainment of the populace in a single series of games. They were pitted against each other, or some other great beasts, but mainly they were matched against the 'bestiarii' or professional animal-killers of the arena. So great and lasting was the demand for this purpose that the supply became scanty, and the Emperor Honorius, in the fifth century, enacted laws prohibiting the killing of African lions. Under this protection they so increased and became so bold in their destruction of villagers and cattle, that Justinian was compelled to rescind the edict. Extraordinary stories are told of the degree of tamability and education reached by some of these ancient lions, but they should be received with distrust. The kittens are playful, gentle, and affectionate, and some adults are docile, subdued, and even seem to care for their teachers, but none is really trustworthy; all must be kept in subjection by fear, and their acquired intelligence is very small. The tricks and performances which the trained beasts of the menagerie go through are usually very simple when analyzed. Lions withstand captivity well, however, and finer specimens have probably been reared in zoölogical gardens than ever were seen in the wilderness. They breed readily, even in traveling menageries, and few if any now exhibited were not born in captivity.

For the Asiatic lion, consult authorities mentioned under TIGER. See Colored Plate of FELIDÆ.

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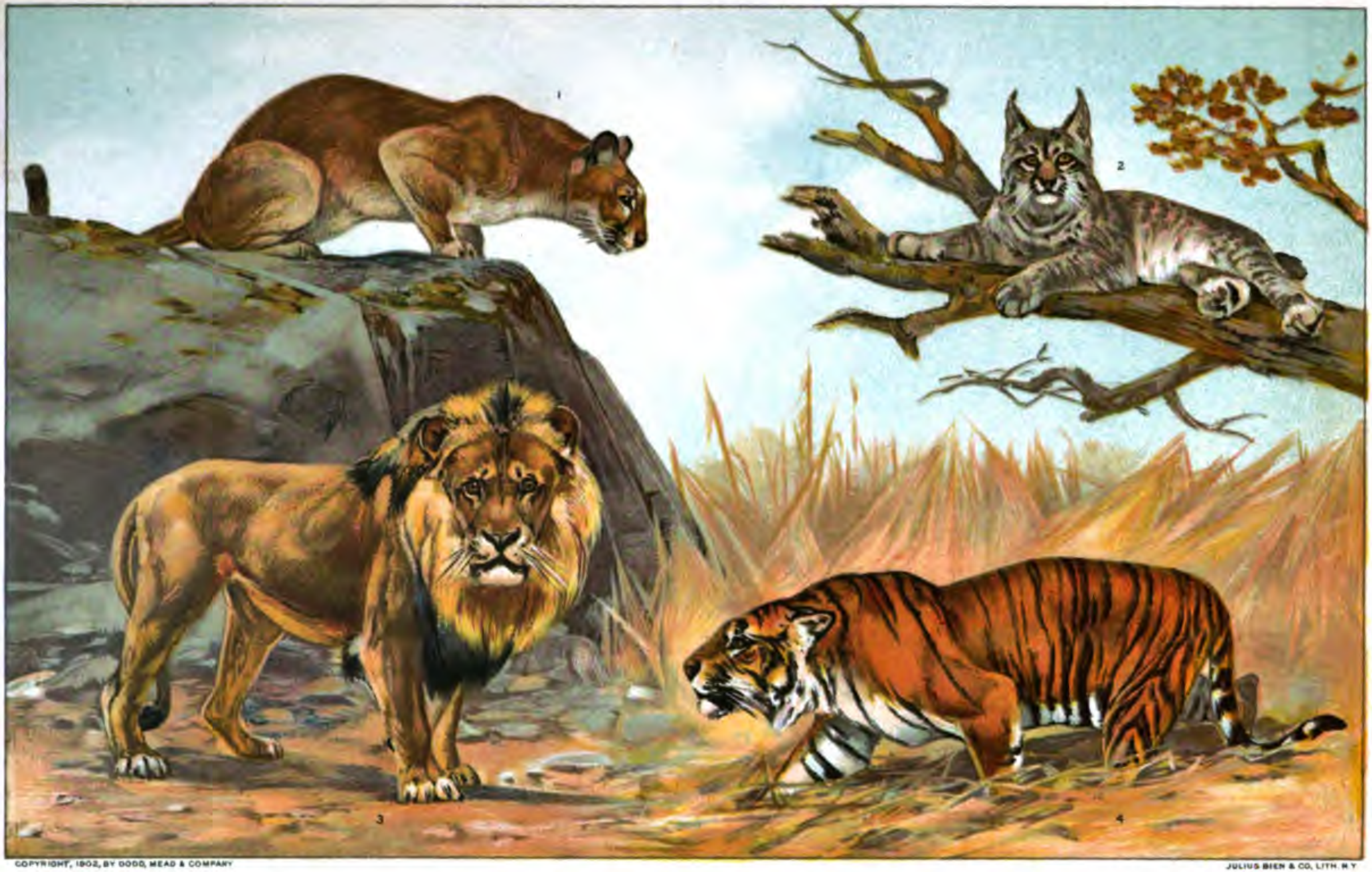
CAT FAMILY - FELIDÆ



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1	PUMA - FELIS CONCOLOR	1/14 NATURAL SIZE
2	LYNX - LYNX BOREALIS	1/15 " "
3	LION - FELIS LEO	1/30 NATURAL SIZE
4	TIGER - FELIS TIGRIS	1/26 " "

1850); Harris, *Wild Sports in Southern Africa* (5th ed., London, 1852); Drummond, *The Large Game . . . of South Africa* (Edinburgh, 1875); Baker, *Wild Beasts and Their Ways* (London, 1890); Cameron, *Across Africa* (London, 1877); Schulz and Hammar, *New Africa* (London, 1897); Holub, *Seven Years in South Africa*, translated by Frewer (London, 1881); Schweinfurth, *Heart of Africa* (Leipzig, 1878); Kerr, *The Far Interior* (London, 1886); Blanford, *Geological and Zoölogical Survey of Abyssinia* (London, 1870); Selous, *A Hunter's Wanderings in Africa* (London, 1890).

LION, lē'ôN', Golfe du. An inlet of the Mediterranean. See Lyons, Gulf of.

LION, Order of the. (1) A civil and military order founded in 1770 by Landgrave Frederick II. of Hesse-Cassel, with one class and 41 knights. In 1818 it was extended to four classes, but has now only one class. It is restricted to members of the grand ducal house and princes. (2) A civil order with three classes founded in 1815 by William I., King of the Netherlands. The decoration is a white enameled cross with four W's, bearing the motto *Virtus nobilitat* (virtue ennobles), and on the reverse the golden lion.

LION-FISH. A gray, yellow-blotched sculpin (*Scorpæna grandicornis*), common among seaweed from Florida to Brazil, and on account of its ugly aspect much dreaded by the fishermen.

LION GATE. The entrance to the acropolis of Mycenæ. The gateway, about 10 feet in height and width, is at the end of a passage flanked by cyclopean walls designed to expose an attacking enemy to the missiles of the defenders for a considerable distance. The great gate-posts, of single blocks, approach slightly at the top. On them rests a lintel composed of a block 15½ feet long and 8 feet thick. Above the lintel a triangular space is left to distribute the vertical pressure, and is occupied by a slab 12¼ feet wide and 10¼ feet high on which is carved the celebrated relief which gives the gate its name. The middle of the slab is occupied by a column, flanked by two lions, whose hind feet are on the ground, while the fore feet rest on the base of the column. The heads are turned to the front.

LIONNE, lē'ŏn', Hugues de, Marquis de Berni (1611-71). A French statesman, born at Grenoble. He was of a noble family of Dauphiné, and was brought up by his uncle, Abel de Servien, under whom he received his first training in diplomacy. As secretary of the French Embassy, he was present at the Congress of Münster (1641), and the following year was sent on a mission to the Pope. Mazarin, then Prime Minister, recognized the uncommon qualities of the young man, and made him secretary to the Queen Mother, Anne of Austria (1646). Afterwards he was Ambassador to Spain, Frankfort, and Turin, and as Minister of State, a position he received in 1659, concluded the Peace of the Pyrenees (1659). On his death-bed Mazarin recommended Lionne to the King, and for the next ten years he had charge of foreign affairs. Among his most important negotiations were the sale of Dunkirk, the Treaty of Breda (1667), and the Treaty of Aix-la-Chapelle (1668). His *Memoirs* and letters are of value as throwing light on the diplomatic relations between France and Europe in the early part of the reign of Louis XIV. Consult: Valfrey, *Hugues de Lionne, ses ambassades en Italie, en Espagne et en Allemagne* (Paris, 1877-81); Chevalier, *Lettres inédites de Hugues de Lionne, ministre des affaires étrangères sous Louis XIV., précédées d'une notice historique sur la famille de Lionne* (Valence, 1879).

LION OF BELFORT. A colossal figure by Bartholdi carved in the face of the cliff at Belfort, France, commemorating the defense of the town during the Franco-Prussian War.

LION OF LUCERNE. A memorial at Lucerne, Switzerland, to the 781 Swiss guards who fell on August 10, 1792, in defense of Louis XVI. during the attack on the Tuileries. The figure is carved in the face of a cliff, and represents a dying lion of colossal size, transfixed by a spear, but defending the lilies of France. The memorial was modeled by Thorwaldsen and was dedicated in 1821. Beneath it are inscribed the names of the 21 officers of the guards.

LION OF SAINT MARK. A winged lion in bronze on one of the columns in the Piazzetta at Venice, the device of the ancient Republic. The bronze was carried to Paris by Napoleon in 1797, but was restored in 1815.

LION OF THE NORTH. A title given to Gustavus Adolphus of Sweden.

LION'S MOUTH (It. *Bocca di Leone*). An opening in the wall of the Sala della Bussola, the ante-chamber of the Inquisitors, in the Palace of the Doges at Venice. The opening was once adorned with a marble lion's head, the mouth of which served as a channel for secret information and anonymous accusations.

LION-TAILED MONKEY. A macaque (*Macacus Silenus*) of Western India. It is of medium size, almost black in color and with the end of the comparatively short tail tufted. A large ruff of white hair surrounds the face and neck. This species goes in troops in the forest, is often called 'wanderoo'; and is sulky and intractable in captivity.

LIOTARD, lē-ō'tär', Jean Etienne (1702-89). A Swiss painter, born at Geneva. He was a pupil of Jean Baptiste Massé and of Le Moyne in Paris, whither he went in 1725. He was in Constantinople for several years and portrayed many dignitaries and foreign ambassadors. In 1749 he went to Vienna and thence to Paris and London. Everywhere he had painted the portraits of the great. After his sojourn in Constantinople he adopted the Turkish costume and hence was nicknamed 'the Turk.' In or about 1756 he visited Holland, was married there, and in 1772-74 was again in England, where he sold advantageously a valuable collection of paintings by celebrated masters. His forte lay in pastel portraits, among which is the world-famed "Vienna Chocolate Girl," in the Dresden Gallery. The Amsterdam Museum contains "La belle Lyonnaise" (1746, replicas in Dresden and Vienna), and more than a dozen other portraits, including those of Maria Theresa, Joseph II., and Marshal Maurice of Saxony. Portraits of himself are in Dresden and in the Uffizi Gallery at Florence.

LIOY, lē-ō'ē, Paolo (1836—). An Italian naturalist, best known for his studies of the lake-dwellers. He was born in Vicenza, studied at Padua, and in 1866 was banished for expressing anti-Austrian sentiments in a newspaper article.

He was elected to the Italian Parliament after the Austrian evacuation, took some part in politics, voting with the Moderate Liberal Party, and wrote some fictions, biographies of Agassiz and of Darwin, and the following important scientific works: *Di una stazione lacustra scoperta nel lago di Fimon* (1864, 3d ed. 1876); *La abitazioni lacustri della età della pietra* (1865); *Conferenze scientifiche* (1872, 2d ed. 1877); *Sui laghi* (1884); and *Escursione nel cielo* (4d ed. 1885), as well as other works on alpine climbing.

LIPA, lē′pȧ. A town of Luzon, Philippines, in the Province of Batangas (Map: Philippine Islands, F 6). It is situated in a mountainous district, 14 miles northeast of Batangas, on the proposed railroad between that city and Manila. It is a progressive town, the largest in the province both in extent and population, and has a large church, and good schools and markets. Good military roads lead from it, and it is an important centre for the sugar, coffee, and tobacco trade. Population, 14,000; of the municipality, 40,733.

LIPÁN, lê-pän′. A roving and predatory Athapascan tribe formerly ranging chiefly in southeastern Texas, between the Nueces and the Rio Grande, as well as in the adjacent northern States of Mexico. They lived entirely by hunting, without any fixed habitation or territorial claim, in consequence of which the estimates of their numbers vary greatly, but they were estimated at 2600 in 1822 and 800 in 1816, the latter number being probably near the true figure. In 1847, in consequence of an encounter with Texas troops, they fled far up into Texas, where they joined forces with the kindred Mescalero and remained bitterly hostile for several years. About this time they were described as having many guns and being perhaps the bravest and most daring of all the native Texas tribes. In 1855 they were reported to have crossed the Rio Grande and settled in Mexico under protection of that Government. There is no evidence that they ever returned as a tribe, although a few individuals, perhaps fifty in all, are living with the Mescalero, Kiowa-Apache, and Tonkawa in this country, but the main body is supposed to be settled with other refugee Indians from the United States, in the Santa Rosa Mountains of Coahuila, Northern Mexico.

LIPARI, lĭp′ȧ-rĭ *or* lē′pȧ-rê (or ÆOLIAN), **ISLANDS.** A group of small islands in the Mediterranean, immediately north of Sicily, between 14° 15′ and 15° 15′ east longitude (Map: Italy, J 9). It consists of Lipari, the largest island, Salina, Vulcano, Filicuri, Stromboli, Panaria, and Alicuri, and a few islets. The total area is about 50 square miles. They are all of volcanic origin, and the islands of Stromboli and Vulcano still contain active volcanoes, Stromboli having been the scene of an eruption in 1902. The climate is mild and healthful. In spite of their volcanic nature, mountainous surface, and scarcity of water, the islands are, as a rule, well cultivated, producing wine, currants, olives, figs, and other southern fruits. The island of Lipari yields large quantities of pumice-stone and contains hot springs. The group forms a part of the Sicilian Province of Messina. Population, in 1901, 20,455. The town of Lipari, on the eastern coast of the island of the same name, has a good harbor. Population, in 1881, 4968. Consult *Die liparische Inseln* (Prague, 1803 et seq.).

LIP′ARITE. See RHYOLITE.

LIP′ASE (from Gk. λίπας, *lipas*, λίπος, *lipos*, fat). An enzyme which saponifies fats, i.e. decomposes them into fatty acids and glycerin. Among plants lipase is found in oily seeds when they germinate. It is especially abundant in such seeds as castor-oil, hemp, rape, and flax. It is doubtless also present in other parts of the plant where oil constitutes a reserve food. In germinating seeds the oil gradually disappears, the lipase digesting it and so rendering it available for the nutrition of the young embryo. The precise products of its action are not known.

LIPETSK, lyĕ′pĕtsk. The capital of the District of Lipetsk in the Government of Tambov, Russia, situated on the Voronezh, 107 miles west of the town of Tambov (Map: Russia, E 4). It has manufactures of spirits, sugar, iron, brick, and tallow. There are exports of grain. It has noted chalybeate springs. Population, in 1897, 20,323.

LIP′OGRAM (from Gk. λείπειν, *leipein*, to leave + γράμμα, *gramma*, letter). A species of verse characterized by the exclusion of a certain letter, either vowel or consonant. The earliest author of lipogrammatic verse was the Greek poet Lasus (born B.C. 538); and it is recorded of one Tryphiodorus, a Græco-Egyptian writer of the same period, that he composed an Odyssey in twenty-four books, from each of which, in succession, one of the letters of the Greek alphabet was excluded. Fabius Claudius Gordianus Fulgentius, a Christian monk of the sixth century, performed a similar feat in Latin. In modern times the Spaniards have been most addicted to this laborious frivolity. Lope de Vega wrote five novels, from each of which one of the vowels is excluded; but several French poets have also practiced it. The subject is discussed by Addison in an essay on true and false wit in No. 59 of the *Spectator*. Consult Wheatley's book on *Anagrams* (1862).

LIPPE, lĭp′pe (sometimes called **LIPPE-DETMOLD,** dĕt′môlt). A principality and constituent State of the German Empire, bounded by the Prussian provinces of Westphalia and Hanover and an enclave of the Principality of Waldeck (Map: Germany, C 2). It occupies, together with its three small exclaves in Westphalia, an area of 469 square miles.

The region is generally hilly and well wooded. In the southwestern part it is traversed by the Teutoburger Wald, where it reaches an altitude of over 1500 feet. Hydrographically it belongs to the basin of the Weser, and is watered by the Werre and several other tributaries of that river. The Weser also touches it on the north for a short distance. The climate is moderate and healthful. With the exception of salt, there are practically no minerals in the principality. Mineral springs are found in some parts. The soil is of indifferent fertility, but agriculture is nevertheless the chief occupation. The land is divided principally into medium holdings, which are protected from subdivision by the right of primogeniture. Over one-half of the area is under crops, chiefly rye and oats. Stock-raising is also of importance.

Lippe is one of the best wooded parts of Germany. The forests (largely deciduous) cover over one-fourth of the total area, and the greater part belongs to the State. The manufacturing industries are undeveloped. Yarn-spinning and linen-weaving are carried on as house industries to a limited extent. The commerce is also of little importance, the principal exports being agricultural and forest products, yarn, and linen. Native artisans, especially brickmakers, emigrate periodically in large numbers to other parts of Germany and even to foreign countries. The principality is traversed by two State railway lines. Their total length is 52 miles. Lippe is a constitutional monarchy, the crown being hereditary in the male line. The Constitution provides for a Diet of 21 members elected directly for four years, by voters divided into three grades, according to the amount of taxes paid, each grade electing 7 representatives. The executive and judicial parts of the administration are vested in the Cabinet. There is a Supreme Court at Detmold, the capital, from which appeals are made to the Court of Appeals at Celle, Hanover. Lippe is represented by one member in the Bundesrat and one in the Reichstag. The budget for 1900-01 balanced at about $333,000. The public debt amounted, in 1901, to $306,544. Education is well provided for, and the military affairs of the principality are in the hands of Prussia. Population, in 1890, 128,495; in 1900, 139,238, almost exclusively Protestant.

History. The Principality of Lippe first appears as an independent country in 1123. Its history was uneventful. In 1807 it joined the Confederation of the Rhine. In 1836 a constitution was promulgated, and the country joined the German customs union. As in most of the German States, its ruler, Prince Paul Leopold Alexander, had to promulgate a new Constitution in 1848, but his son Leopold, who came to the throne in 1851, reëstablished in 1853 the old Constitution. In the war of 1866 Lippe took the side of Prussia, and joined the North German Confederation. In 1871 it became a part of the new German Empire. Since then the only disturbing factor has been the conflict regarding the succession which has raged between the Houses of Lippe-Biesterfeld and Schaumburg-Lippe. Consult: Schickedanz, *Das Fürstentum Lippe-Detmold* (Hildesheim, 1830); Laband, *Der Streit über die Thronfolge im Fürstentum Lippe* (Berlin, 1896).

LIPPE-SCHAUMBURG, shoum'bo͞ork. A principality of Germany. See Schaumburg-Lippe.

LIPPI, lĭp'pê, Filippo. The name of two prominent Florentine painters of the early Renaissance.—Fra Filippo (c.1406-69), the father, was the son of a butcher of Florence. At the death of his parents, when only eight years old, he was placed in the Carmelite convent at Florence, and in 1421 he joined the Order. Vasari's story of his life is largely fabulous. It is unlikely that he was taken a prisoner by the Moors and transported to Barbary. He left the convent in 1431, with the consent of his superior. He was employed in various paintings by Cosimo de' Medici. In 1456 he was appointed chaplain of the nunnery at Prato, whence he eloped with a nun, the beautiful Lucrezia Buti. They were joined by Lucrezia's sister Spinetta, but the two nuns were taken back to the convent in 1458, only to escape again to Filippo. Finally, at the intercession of Cosimo de' Medici, the Pope released Filippo and Lucrezia from their vows, and they were married. Filippo died at Spoleto, October 9, 1469.

Fra Filippo was a pupil of Masaccio, but his art was also influenced by the idealism of Fra Angelico. His works are warm and transparent in color, and are full of human sympathy. He was the first to paint a class of pictures characteristic of the Florentine school, in which the Virgin is portrayed as a Florentine mother, and maternal love and childlike innocence are the themes represented. His greatest surviving works are the frescoes in the Cathedral of Prado (1452-64), which are worthy of being compared with those of Masaccio in the Brancacci Chapel. They represent scenes from the lives of John the Baptist and Saint Stephen. Although he is inferior to Masaccio in composition and simplicity, and though he places too much emphasis on subsidiary figures, Fra Filippo excels in individual figures and in the delineation of costume. The frescoes in the apse of the Cathedral of Spoleto, completed after his death by Fra Diamante, his pupil, are charming decorations.

Filippo shows to best advantage in his easel pictures. Among the very best of these is the famous "Coronation of the Virgin," painted in 1441 for the nuns of San Ambrogio, now in the Florentine Academy. The Academy also has a fine "Madonna with Saints," as has the Louvre; there are charming "Holy Families" in the Berlin Museum, the galleries of Munich and Prato, the Pitti Palace, Florence, and especially in the Uffizi. In the National Gallery, London, are the "Vision of Saint Bernard" (1445) and an "Annunciation;" in the Berlin Museum, the "Virgin Adoring the Infant," and "Mary, Mother of Mercies," in which the Virgin is represented with large numbers of kneeling worshipers under her wide-spreading mantle, on either side. Fra Filippo was the head of an important school, and among his pupils were Sandro Botticelli, Benozzo Gozzoli, and his son.

Filippo Lippi, the younger, called Filippino Lippi (c.1457-1504). He was a son of Fra Filippo and Lucrezia Buti, and was born at Prato. He acquired the rudiments of art from his father, and after the latter's death he was apprenticed to Sandro Botticelli. One of his earliest and greatest works was the completion of the frescoes of Masaccio in the Brancacci Chapel (1480-85). He executed the task in a masterly manner, adapting his style to that of Masaccio, although retaining his individuality. The greater part of "Saints Peter and Paul Raising the Dead Youth," which Masaccio had begun, is by him, and he also painted the frescoes "Peter and Paul Before Nero," and the "Crucifixion of Saint Peter." While these works are not as simple and strong as those of Masaccio, they are nevertheless fine and dignified in composition, and more graceful.

Filippino's earliest paintings show the influence of his father. This is especially the case in the "Vision of Saint Bernard," in the Badia at Florence, executed in tempera, but fine in color as an oil painting, and delightful in sentiment. His other works of the early period include the "Virgin Enthroned" (1486), in the Uffizi, suggesting Botticelli, and a fine "Madonna" in Santo Spirito, Florence; several madonnas and a fine "Crucifixion" in the Berlin Museum. To his late period, after the Roman visit, belong "Christ Appearing to the Virgin," Munich Pinakothek; "Adoration of the Kings" (1496), Uffizi; "Meeting of Joachim and Anna," Gallery of Copenhagen; and especially the "Marriage of Saint Catharine," an altarpiece in San Domenico, Bologna. In 1488 Filippino was commissioned to execute in the Church of Santa Maria sopra Minerva, Rome, a cycle of frescoes illustrating the dogmas of the Order of Saint Dominic, which he executed with masterly skill. He was very much impressed by the monuments of Rome, as is especially shown in his use of Renaissance decoration in later works. In 1502 he completed the frescoes of the Strozzi Chapel, in Florence, with subjects from the history of Saints Philip and John. He died April 18, 1504, at Florence.

Bibliography. Materials for the life of Fra Filippo will be found in the second volume of Vasari's *Vite*, edited by Milanesi (Florence, 1878). See also the articles on both artists by Woermann, in Dohme, *Kunst und Künstler Italiens* (Leipzig, 1878).

LIP'PIA (Neo-Lat., named in honor of the French physician and traveler Augustus Lippi). A genus of shrubby and half-shrubby plants, including about ninety species, mostly American, and among them the common lemon verbena (*Lippia*, or *Aloysia, citriodora*). This was formerly a favorite in old-fashioned flower-gardens, especially in England, because of its fragrant leaves. It is a low, tender shrub, deciduous in northern climates, and should be brought into the greenhouse on the approach of frost. It grows readily from cuttings.

LIP'PINCOTT, Joshua Ballinger (1813-86). An American publisher, founder of the house which bears his name. He was born in Burlington County, N. J., removed to Philadelphia about 1828, and entered the book business. In 1836 he organized the firm of J. B. Lippincott & Co., and in 1850 bought the entire business of Grigg & Elliott, one of the best known firms in Philadelphia. In 1885 the name of the concern was altered to the J. B. Lippincott Co. Upon his death he was succeeded in the presidency by his son, Craige (1846—). Craige was born in Philadelphia, studied at the University of Pennsylvania and in Europe, and entered the publishing house in 1866.

LIPPINCOTT, Sara Jane (Clarke) (1823-1904). An American author, chiefly known by the pseudonym 'Grace Greenwood.' She was born in New York in 1823, was educated at Rochester, N. Y., and began to write at an early age. In 1853 she was married to Leander K. Lippincott. Among her works are: *Greenwood Leaves* (1850); *History of My Pets* (1850); *Poems* (1851); *Haps and Mishaps of a Tour in England* (1854); *Merrie England* (1855); *Stories from Famous Ballads* (1860); *Records of Five Years* (1867); and *Stories and Sketches* (1893). She established *The Little Pilgrim*, a paper for children, and appeared extensively upon the platform as a lecturer and dramatic reader.

LIPPINCOTT, William Henry (1849—). An American artist, born in Philadelphia. He received his education at the Friends' Private Academy; then entered the Pennsylvania Academy of Fine Arts, became an illustrator and scene painter, and in 1874 went to Paris, where he was a pupil of Léon Bonnat. In 1882 he returned to America and opened a studio in New York. His pictures include "Un jour de congé," "Helena," and "Infantry in Arms."

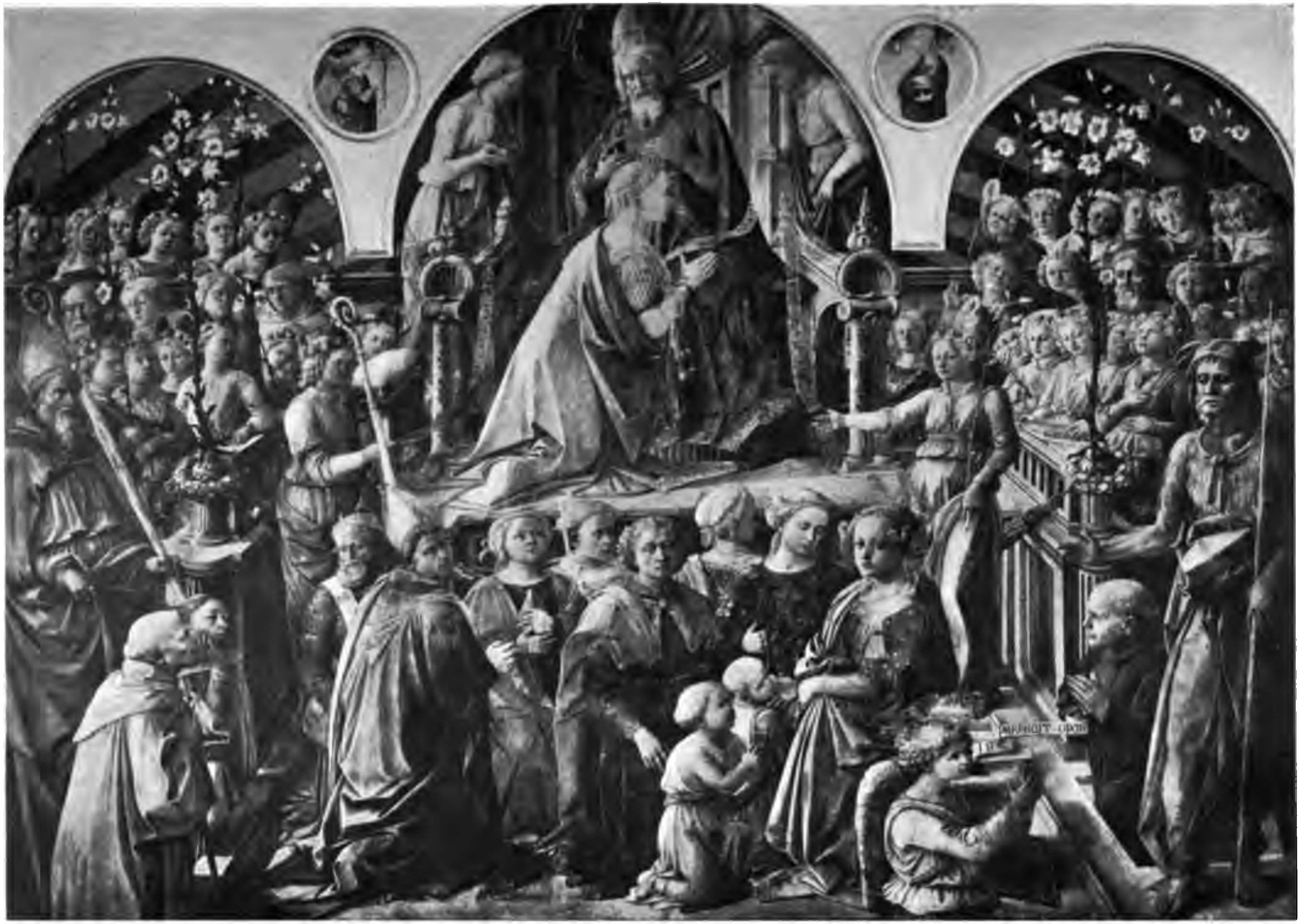
LIPPMANN, lêp'mäN', Gabriel (1845—). A French physicist, born at Hallerich in Luxemburg. He entered the scientific department of the Ecole Normale in Paris in 1868, and four years later went to Germany, where he studied physics and chemistry. On his return to Paris he earned the doctor's degree with remarkable theses entitled *Relation entre les phénomènes électriques et capillaires*. He enunciated the principle of the conservation of electricity, and in 1891 discovered a method of photographing in colors. He became a professor in the University of Paris in 1883. Besides a number of memoirs, he published *Cours de thermo-dynamique* (1888); *Cours d'acoustique et d'optique* (1888); and other works.

LIPPS, lĭps, Theodor (1851—). A German psychologist, professor of philosophy at Munich. He was born at Wallhalben, Bavaria, July 28, 1851, and is best known for his contributions to the psychology of space-perception and to psychological æsthetics. He published *Grundtatsachen des Seelenlebens* (1883); *Psychologische Studien* (1885); *Der Streit über die Tragödie* (1890); *Aesthetische Factoren der Raumanschauung* (1891); *Grundzüge der Logik* (1893); *Zur Psychologie der Suggestion* (1897); *Raumästhetik und geometrisch-optische Täuschungen* (1897); *Komik und Humor: eine psychologisch-ästhetische Untersuchung* (1898); *Ethische Grundfragen* (1899); and was also one of the editors of *Beiträge zur Aesthetik*.

LIPPSTADT, lĭp'stät. A town of Westphalia, Prussia, on the Lippe, 13 miles by rail from Soest (Map: Prussia, C 3). It has a considerable grain trade, and some manufactures of tobacco, rope, and brandy. Population, in 1890, 10,400; in 1900, 12,534. The town was founded in the twelfth century by the Lord of Lippe. From the seventeenth century it was the joint property of Brandenburg and Lippe. In 1850 Lippe ceded its right to Prussia.

LIPS, lêps, Johann Heinrich (1758-1817). A Swiss engraver, born at Kloten, near Zurich. He was the pupil of Lavater at Mannheim, and afterwards studied at Düsseldorf. He twice visited Rome, and was for a while professor at Weimar. He is noted for his plates after the old masters, whose works he interpreted with great skill and finish. He left about 1400 pieces, such as "The Adoration of the Magi," after Annibale Carracci; "The Bacchanal," after N. Poussin; "Charlotte Corday," after Brée, and the portraits of Goethe, Wieland, and Hess. He was also a painter in water-color.—His son and pupil, Johann Jakob (1790-1833), an engraver, made portraits of Ludwig of Bavaria, Heble, and others.

LIPSCHITZ, lĭp'shĭts, Rudolf (1832-1903). A German mathematician, born in Königsberg, Prussia. In 1857 he became a privat-docent in Bonn, and in 1862 professor at Breslau. Two years later he returned to Bonn as professor, where he remained until his death. He was an extensive contributor to mathematical literature, especially in the higher analysis, including the calculus of variations, the theory of Bernoulli numbers, Bessel's functions, Fourier's series, and the theory of prime numbers. These contributions appeared chiefly in Crelle's



FRA FILIPPO LIPPI

"THE CORONATION OF THE VIRGIN," FROM THE PAINTING IN THE ACADEMY OF FINE ARTS, FLORENCE

Journal and in the *Comptes rendus*. He wrote *Lehrbuch der Analysis* (2 vols., Bonn, 1877, 1880); *Wissenschaft und Staat* (ib., 1874); *Untersuchungen über die Summen von Quadraten* (ib., 1886); *Bedeutung der theoretischen Mechanik* (Berlin, 1876).

LIPSIUS, lē'psē-ụs, Ida Maria (1837—). A German writer on music, known by her pseudonym, 'La Mara.' A sister of the classical philologist Justus Hermann Lipsius, she was born in Leipzig, and wrote several sketches of travel, *Im Hochgebirge* (1876), *Sommerglück* (1881), and *Im Lande der Sehnsucht* (1901). Her musical publications include the essays *Musikalische Studienköpfe* (1891) and *Klassisches und Romantisches aus der Tonwelt* (1892); the collection of *Gedanken berühmter Musiker über ihre Kunst* (1873), and of *Musikerbriefe aus fünf Jahrhunderten* (1886); editions of Liszt's letters (1893-1902), of his correspondence with von Bülow (1898), and of Berlioz's letters to Princess Sayn-Wittgenstein (1903); and a translation into German of Liszt's *Chopin* (2d ed. 1896).

LIP'SIUS, Justus (1547-1606). The Latinized form of Joest Lips, a celebrated philologian and humanist, born at Overyssche in Brabant. He studied at the Jesuit College in Cologne and at Louvain. In 1567 he published his essays, *Variarum Lectionum Libri Tres*, which secured him the favor of Cardinal Granvella, who took him to Rome and made him his secretary. From 1569 to 1572 he led the life of a wandering scholar in the Low Countries, Germany, and Austria, turning Lutheran in the latter year to take the chair of history at Jena, where he remained for two years. After living for some time at Cologne, Louvain, and Antwerp he became in 1579 professor of history at Leyden, embracing at the same time the Calvinistic faith. In 1592 he became reconciled with the Church, and received the chair of Latin at Louvain. There he remained till his death. Probably the greatest authority of his age on Roman antiquities, Lipsius contributed greatly to the development of the study of the language and history of ancient Rome by a large number of editions of the Latin historians and philosophers, preëminent among which is the monumental edition of Tacitus, which has remained a standard to the present day (1st ed., Antwerp, 1574; 6th ed., corrected by the author, 1605). He also published editions of Velleius Paterculus, Valerius Maximus, and Seneca, besides numerous original contributions dealing with the material and intellectual life of the ancient Romans. Among these are: *De Amphitheatro* (1584); *De Cruce* (1593); *De Militia Romana* (1595); *De Vesta et Vestabilus Syntagma* (1603). His philosophical views, which were those of the Stoics, were embodied in the *De Constantia* (1584) and the *Manuductio ad Stoicam Philosophiam* (1604). His correspondence has been published in part. His *Opera Omnia* appeared at Antwerp in 1637. Consult: Galesloot, *Particularités sur la vie de Justus Lipsius* (Bruges, 1877); Amiel, *Un publiciste du 16ème siècle; Juste Lipse* (Paris, 1884).

LIPSIUS, lē'psē-ụs, Justus Hermann (1834—). A German classical philologist, born at Leipzig, professor in the university of his native city. He was editor of Andocides (Leipzig, 1888); Demosthenes, *On the Crown* (ib., 1884); reviser of Meier and Schömann's *Der attische Prozess* (2 vols., Berlin, 1883, 1887); and of Schömann's *Griechische Altertümer* (2 vols., ib., 1897, 1901). He wrote numerous philological papers.

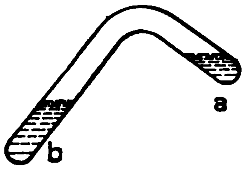
LIPSIUS, Richard Adelbert (1830-92). A German theologian, brother of the preceding, born at Gera. He studied at Leipzig, was appointed professor of theology there, and afterwards at the universities of Vienna, Kiel, and Jena. In 1874 he was nominated a member of the Weimar Synod. Lipsius belongs to the moderate representatives of liberal theology; in historical research he recognizes the propriety of scientific criticism, and on matters of dogma sides with Kant, who requires harmony between revelation and the actual existence of the world. His *Lehrbuch der evangelisch-protestantischen Dogmatik* (1876-93) is noteworthy. His other contributions to theological literature include: *Der Gnosticismus*, in Ersch and Gruber's *Encyclopädie* (1860); *Die Quellen der ältesten Ketzergeschichte* (1879); *Philosophie und Religion* (1885); and *Unser gemeinsamer Glaubensgrund im Kampfe gegen Rom* (1890).

LIPTON, Sir Thomas Johnstone (1850—). A British merchant and yachtsman. He was born in Glasgow, Scotland, of Irish parentage, worked in the United States when a boy, and in 1876 opened a grocery store in Glasgow. His business developed to the control of many stores in Great Britain, tea, coffee and cacao estates in India and Ceylon, and a large pork packing establishment in Chicago. An enthusiastic yachtsman, he made several attempts to win back the America's cup. He was knighted in 1898, and made a baronet in 1902.

LIQUATION. See Silver.

LIQUEFACTION OF GASES (Lat. *liquefactio*, from *liquefacere*, to make liquid, from *liquidus*, liquid, from *liquere*, to be fluid + *facere*, to make). Matter exists in different forms as solids, liquids, and gases, which may be roughly discriminated: A solid is matter in such a form that it keeps both its size and shape under all ordinary conditions; a liquid has as a rule a definite volume, but will assume the shape of any vessel in which it is placed; while, if allowed to fall freely so as to form drops, these are spherical; a gas, on the other hand, will take both the shape and volume of the solid vessel which contains it. Water in these three forms is ice, ordinary water, and steam. Every one is familiar with the fact that it is easy to make any one of these forms of water pass into any other. Thus, in nature, we have the formation of ice, hail, and snow, all of which in turn melt and form water or else vaporize and form steam. Similarly, we have the water evaporating from the surfaces of lakes and oceans, and the reverse process, the formation of rain and dew. These changes of matter from one form into another are called 'changes of state,' and the subject "Liquefaction of Gases" deals with the conditions under which matter in the gaseous condition can be made to assume the liquid one. The real test of matter being in the liquid state is its capability of forming drops, or of having a sharp surface of separation from the gases above it.

The first philosopher who considered this problem was probably Van Helmont, who lived in the latter part of the sixteenth and the early part of the seventeenth century. He introduced into science the word gas and distinguished between what he called 'gases' and 'vapors,' saying that the latter could be condensed into the liquid state, while the former could not. This distinction has persisted in science up to within recent years. As early as the first year of the nineteenth century Dalton, the great English chemist, made the statement: "There can scarcely be a doubt entertained respecting the reducibility of all elastic fluids of whatever kind into liquids; and we ought not to despair of effecting it in low temperatures, and by strong pressures exerted by the unmixed gases." But up to the time of Faraday comparatively little experimental work had been done.



APPARATUS OF FARADAY FOR THE LIQUEFACTION OF CHLORINE, SULPHUROUS ACID GAS, ETC.

The substances which by their reaction produce the gas are placed in one end of a bent glass tube, and the open end is then sealed. If these reacting substances are in the end a, this is heated, thus causing the active evolution of the gas, while the other end, *b*, is cooled as far as necessary or possible. Thus the gas in the end *b* is under high pressure and at a low temperature.

In 1823, at the suggestion of Sir Humphry Davy, Faraday began a series of experiments which ended in his securing a general method for the liquefaction of gases which he applied to chlorine, sulphurous acid, carbonic acid, cyanogen, and many others. This method was to generate the gases in large amounts in a small space so that the pressure was great and then to cool the gases, while under this high pressure, to a sufficiently low degree. In 1845 Faraday published a second series of researches describing his observations on gases which he had succeeded in liquefying, by making use of temperatures much lower than those which he had been able to obtain in his first investigation. He thus succeeded in liquefying all gases then known, with the exception of hydrogen, oxygen, nitrogen, nitric oxide, and marsh gas. He subjected oxygen to a pressure of about 1000 pounds to the square inch, but it showed no signs of liquefaction. In speaking, however, of his efforts to liquefy these so-called 'permanent gases,' he states: "Further diminution of temperature and improved apparatus for pressure may very well be expected to give us these bodies in the liquid or solid state."

This hope of Faraday's was rendered much more certain by the work of Andrews on the properties of carbon dioxide under varying temperatures and pressures which began in 1863, and was published finally in 1869. The chief result of Andrews's work was the proof that for carbon dioxide, and probably therefore for other gases, there was a certain temperature, different for different substances, below which the gas must be cooled before any amount of pressure, however great, would cause it to liquefy. This temperature is called the 'critical temperature.' It was evident, then, that the explanation of all previous work on the liquefaction of gases which had been successful was the fact that the experimenters had used gases whose critical temperatures were not lower than the lowest temperatures available in laboratories; while the lack of success in the attempts to liquefy the permanent gases was owing to the fact that the critical temperatures of these gases were extremely low. The problem, then, to liquefy the permanent gases took the form of an investigation as to the means of securing extremely low temperatures.

Methods for the production of low temperatures may be conveniently divided into four classes.

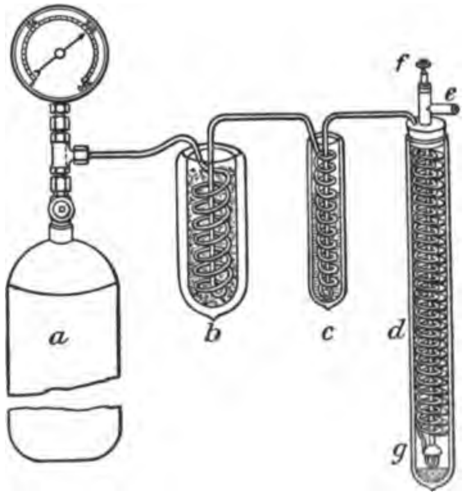
THE USE OF FREEZING-MIXTURES. It has been known for many years that a mixture of common table salt and ice produced a temperature many degrees below that of melting ice when pure; namely, 0° C. The lowest temperature available by using this salt and ice, when mixed in suitable proportion, is —22° C. It was found, however, by Thilorier that by mixing solid carbon dioxide, which he was able to secure by a method to be described presently, and ordinary sulphuric ether the mixture had a temperature of —110° C. This mixture, always known as 'Thilorier's mixture,' was first studied by him in 1834 and formed for many years the only means of securing extremely low temperatures. In fact, there is at the present time no freezing-mixture in use that gives a temperature lower than this.

THE METHOD OF EVAPORATION. It was recognized by all the investigators in the subject of heat, notably by Leslie and Black, that when a liquid evaporated rapidly the surrounding objects, and especially the solid vessels which contained the liquid, gave up a great deal of heat and that thus their temperature fell. This is owing to the fact that it requires heat to produce evaporation; and so, if evaporation ever takes place, a definite amount of heat must be taken away from the neighboring matter. In this manner Leslie and Wollaston showed that water could be frozen by means of its own evaporation. The first use, however, of this fact concerning the low temperatures produced by evaporation made to secure liquefaction of gases was in the investigation of Bussy in 1824, who observed that if liquid sulphurous acid was made to evaporate rapidly he could get a temperature as low as —65° C., and using this method he liquefied chlorine, ammonia, and cyanogen, and, in fact, solidified the last-named gas. This method of securing low temperature immediately came into general use and is still used in many processes.

METHOD OF EXPANSION. It was noted by many investigators early in the nineteenth century, if not before, that when a gas under high pressure is allowed to expand into the open air, or to escape through a small opening, it experiences a drop in temperature; and the laws concerning this fall were studied by Gay-Lussac and many others. The first practical use, however, of the method with reference to liquefying gases was made in 1834, while Thilorier liquefied and even solidified carbonic-acid gas by allowing it to expand suddenly. He made use further of the low temperatures thus obtained by expansion in studying many physical properties of bodies. This method was extended also by Mitchell in 1839 and was used practically by Dr. John Gorrie, who, in 1849, constructed an ice-machine based on the low temperature produced by the expansion of compressed air. This method of first compressing a gas, causing it to be cooled to a temperature as extreme as possible by ordinary means, and then allowing it to expand suddenly is the standard method now in use in all machines made for liquefying gases. There are two processes involved in this production of low temperature by expansion. It is evident that, if a gas compressed in a cylinder is allowed to escape through a small opening, work will be done both in overcoming the pressure of the air and also in giving kinetic energy to the rapidly escaping gas. This work must be done by the gas itself which stays behind and, as it were, pushes out the other gas; and therefore its temperature falls. There is a second reason, however, depending upon the fact first discovered in the experiments by Joule and Thomson (now Lord Kelvin). This is that there is a change in the intrinsic energy of a gas when it occupies a small volume and its molecules are thus close together, and when it fills a larger volume and its molecules are far apart. It is observed that if oxygen or nitrogen or any of the ordinary gases, with the exception of hydrogen, is allowed to expand, doing no external work, the temperature of the gas falls. In the case of hydrogen, it was found that at ordinary temperatures if 'free' expansion takes place, there being no external work done, the temperature rises. However, if the initial temperature of the hydrogen is sufficiently low, then the expansion will produce a further *fall* in temperature. Thus, when any gas is under pressure at a low temperature and is allowed to expand by escaping into a space at a lower pressure, this temperature will fall; and, if it is under sufficiently high pressure, the gas may thus be liquefied.

THE REGENERATIVE METHOD. In this method gas under pressure is allowed to expand, and then, having thus been cooled, it is driven back and made to circulate round the outside of the vessel which contains the compressed gas. In this manner the temperature of the compressed gas is being brought down continually lower and lower, until, finally, it is at a temperature so low that any further decrease in temperature will produce liquefaction. This method was first used by Siemens in 1857. The first suggestion that this principle should be used in the scientific study of the liquefaction of air and other gases was due to Edwin J. Houston in 1874. Since this time the regenerative principle has been used by several investigators, notably by Prof. Kamerlingh Onnes in 1894, and by Professor Dewar in 1895. In all the commercial forms of machines this principle forms one of the essential features of the apparatus.

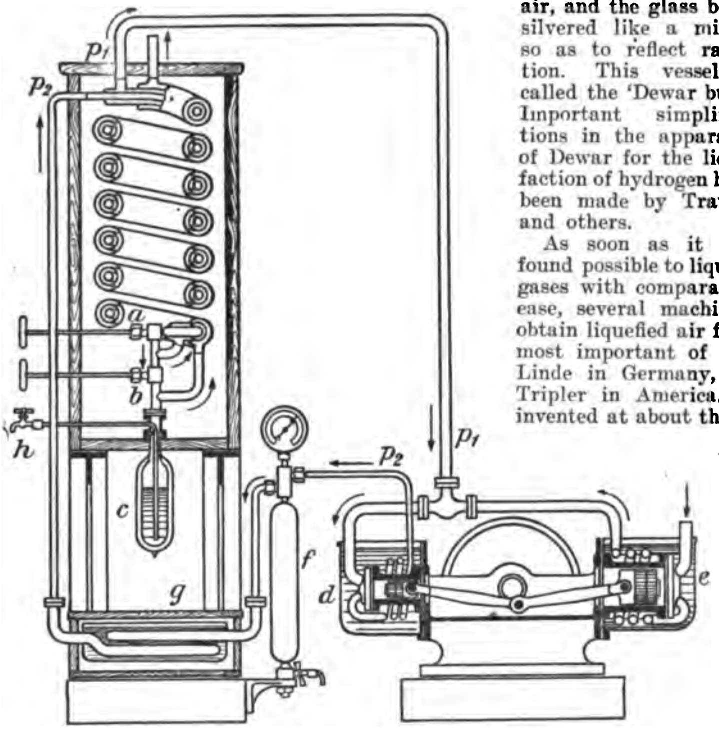
After the publication of Andrews's researches in 1869, work proceeded very rapidly, and finally, in December, 1877, oxygen was liquefied by two investigators working independently: Cailletet, one of the greatest ironmasters of France, experimenting at his works at Châtillon-sur-Seine, and Pictet, a maker of machines for manufacturing ice, working at Geneva. The latter liquefied oxygen at a pressure of 320 atmospheres and a temperature of —140° C., producing his low temperature by a combination of the methods of evaporation and expansion; and the former compressed his oxygen and carbon monoxide to a pressure of 200 atmospheres, cooled it to a temperature of about —28° C., and then allowed it to expand suddenly. Cailletet succeeded in his experiments on December 2d, and Pictet succeeded in his December 22d; an announcement was made to the world of the results of both at the meeting of the French Academy on December 24, 1877. Neither of these observers obtained oxygen in any large amounts or in a static condition, practically only a mist being formed. Cailletet proceeded to liquefy both nitrogen and air; but both he and Pictet secured only the faintest evidence of the liquefaction of hydrogen. The first to obtain oxygen, nitrogen, and carbon monoxide in fairly large amounts were Wroblewski and Olszewski, who began their work at Cracow in 1883. The method used by them was simply to produce a low temperature by a combination of freezing-mixtures and the evaporation of liquids, and under these conditions if the pressure of the gas is sufficiently great it is liquefied. Experiments were made on hydrogen, but their greatest success was simply to obtain a slight froth and other signs of ebullition; they failed to secure any drops of the liquid. These observers were the first to make a careful study of the physical properties of gases at low temperatures, measuring their critical temperatures and pressures, their boiling-points, isothermals, etc. Olszewski succeeded in solidifying a number of gases, especially carbon monoxide and nitrogen, and measured their freezing-points. He was the first to make use of the evaporation of liquid oxygen and liquid air as a means of producing low temperatures.



APPARATUS OF DEWAR FOR THE LIQUEFACTION OF HYDROGEN.

a represents one of the cylinders containing hydrogen under the pressure of about 200 atmospheres; *b* is a Dewar flask containing liquid carbonic acid evaporating under exhaustion; *c* is a similar flask containing liquid air; *d* is the regenerative coil through which the gas under pressure is passed, and over which, after being cooled by expansion, it is drawn; *g* is the pin-hole nozzle through which the compressed gas expands, escaping at the rate of about 15 cubic feet per second; *e* is an opening through which the gas can be withdrawn and again compressed; *f* is the valve by which the size of the pin-hole nozzle *g* is regulated. The flask containing the regenerative coil is a doubly silvered vacuum vessel, and is surrounded with a space kept below —200° C. The liquid hydrogen, when formed, drops from this vacuum vessel into another which is doubly insulated by being surrounded with a third vacuum vessel.

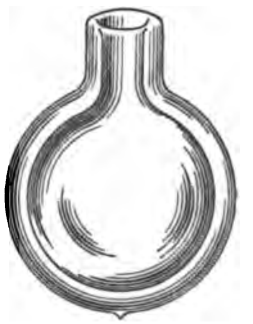
The greatest advances made in recent years in the field of low-temperature research are undoubtedly those due to the investigations of Professor Dewar at the Royal Institution, London, who has used in recent years the regenerative method in producing the requisite low temperatures. By this method he succeeded in obtaining liquid oxygen, nitrogen, and air in practically unlimited amounts; he was able to solidify air as early as 1893; on May 10, 1898, he obtained liquid hydrogen in fairly large amounts, and in 1899 he succeeded in solidifying both oxygen and hydrogen. In fact, he has succeeded in liquefying all known gases with the exception of helium, a gas whose existence on the earth has only recently been discovered. All attempts to liquefy this gas have so far failed, although temperatures as low as —258° C. have been used. There is no reason to doubt, however, that this gas also can be liquefied if suitable means are used.



LINDE APPARATUS.

The most important parts of the Linde machine, as described in the specifications of the makers, are the two-cylinder air-compressor and the counter-current interchanger. The former is driven by means of a belt, from an electric or other motor. The interchanger consists of a triple spiral of three copper tubes wound one inside the other. The compressed air at the temperature of the coil *g* and at about 200 atmospheres pressure passes through the inmost tube of the spiral from top to bottom, and passes out at the lower end through a valve *a* under a pressure of some 16 atmospheres. It returns upward through the annular space between the inner and middle pipes and is then again raised to a pressure of 200 atmospheres by the smaller cylinder *d* of the compressor, and then begins the same cycle over again. The large cylinder *e* of the compressor pumps a small amount of air from the atmosphere into the suction-pipe of the small cylinder, that is to say at 16 atmospheres. A similar quantity of air must therefore leave the cycle at another point so that the pressure may remain constant. This escape of gas takes place at the lower end of the counter-current interchanger immediately after the discharge from 200 to 16 atmospheres, so that a controllable amount of air issues from 16 atmospheres to 1 atmosphere through a second valve *b* and escapes through the outer annular space of the triple copper tube. Part of this air, when the apparatus is cooled down to the temperature of liquefaction, then becomes liquefied and collects in a 'Dewar' flask, *c*, which is fixed to the lower end of the counter-current interchanger. By means of a little pipe reaching to the bottom of the glass vessel the liquid may be run off through the cock *h*. That part of the air issuing from the second valve which is not liquefied leaves the apparatus, escaping through the space between the middle and outside pipes of the spiral into the atmosphere. A small quantity of water is continually injected into the suction-pipe of the low-pressure cylinder in order to fill the clearance and to lower the final temperature of compression. This water, together with the moisture contained in the air, must be as far as possible completely separated out, so as to avoid stopping up the inside coil with ice. This is done first of all by means of a water-separator, *f*, which holds back water carried over with the air in mechanical suspension, and secondly by means of an iron pipe in the form of a coil, *g*, which is cooled down to a few degrees below zero by a freezing-mixture of ice and chloride of calcium, and freezes out the small quantities of water-vapor contained in the highly compressed air until only traces remain.

Professor Dewar discovered in the course of his researches that the best vessel for holding liquefied gases, in order to guard against access of heat from without, was a double-walled glass bulb, the space between the walls being completely exhausted of air, and the glass being silvered like a mirror so as to reflect radiation. This vessel is called the 'Dewar bulb.' Important simplifications in the apparatus of Dewar for the liquefaction of hydrogen have been made by Travers and others.

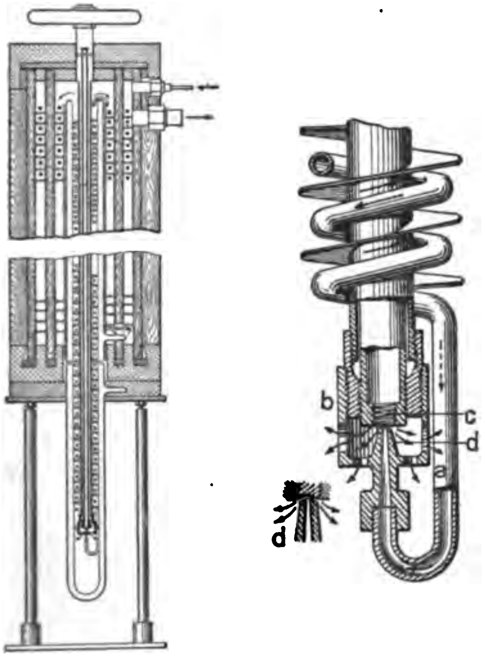


DEWAR BULB.

As soon as it was found possible to liquefy gases with comparative ease, several machines were made in order to obtain liquefied air for commercial purposes. The most important of these are those invented by Linde in Germany, Hampson in England, and Tripler in America. These machines were all invented at about the same time (early in 1895), and all make use of the same principle—viz. the regenerative method. With these machines liquid air can be obtained in almost unlimited quantities and in a comparatively short time.

Innumerable uses have been found for liquefied gases, both in scientific investigations and in industrial applications. The low temperatures which can thus be obtained are useful in many chemical experiments, and also in many spectroscopic investigations where it is essential to secure pure gases. Liquid carbonic acid is used in the preparation of all kinds of aërated waters, viz. 'soda-water,' and also in the manufacture of salicylic acid. Enormous quantities of liquid sulphurous acid, which is used for many purposes, are now prepared for the market. Liquid nitrous oxide is used as an anæsthetic for minor surgical operations, especially in dentistry. Liquefied gases are used in the operation of most ice-machine plants. Liquid oxygen can be obtained commercially and is used extensively in hospitals. It has been thought that liquid air would be used as a motive power, but so far all attempts to control it have failed.

At temperatures as low as those of liquid air and solid hydrogen all the ordinary properties of matter would be expected to change, and a careful study of these changes has been made by many investigators, notably by Professor Dewar. A few facts may be noted here. The electrical resistance of metals decreases as the temperature is lowered, and in many cases the relative order of metals with reference to their electrical resistance is changed at low temperatures. Thus, at ordinary temperatures silver is a better conductor than copper, whereas at —200° the reverse is true. The thermo-electric properties of bodies change to a marked degree. The magnetic moment of magnets is increased by 30 or 40 per cent. as the temperature is lowered to —200°. The elastic constants of bodies increase by as much as four or five times when the temperature is lowered from + 15° to —182°. Rubber becomes brittle. Changes of color often take place, the original hue, however, returning in all cases when the temperature is restored. There are many curious phosphorescent phenomena at low temperature. Milk becomes highly phosphorescent. An egg shines as a globe of blue light. Chemical affinity is almost completely destroyed by cold; phosphorus, sodium, and potassium when placed in liquid oxygen remain absolutely unaffected. Photographic films retain only about one-fifth of their ordinary sensitiveness to light.



APPARATUS OF HAMPSON FOR THE LIQUEFACTION OF AIR.

The gas to be liquefied is introduced through the small tube at the top under a pressure of about 120 atmospheres entering at ordinary room temperature. This tube is extended downward in a spiral wound round the central column; and at its lower end there is an expansion-valve which is regulated from above by means of a screw. (The details are shown in the second cut.) The gas, cooled by expansion, passes up through the apparatus and out again by the large pipe shown at the upper end. The coil a, carrying the compressed gas, ends in the jet *d*, which can be opened or closed by the screw *c*, regulated from above. The path of the gas after expansion is shown by the arrows. The regenerative principle is evident.

Some interesting experiments have been tried dealing with vital phenomena at low temperatures. Warm-blooded animals, of course, perish at comparatively high temperatures, but it was found that bacteria can bear with impunity almost any temperature however low. Sterilization does not result even after an exposure for one hour to a temperature of —182°; the germinating power of seeds is also unimpaired; blood, meat, and milk when sealed in glass tubes undergo putrefaction in the ordinary course. In other words, life can exist at 21° from the absolute zero, and probably much nearer, under conditions which nevertheless almost completely stop chemical and molecular action.

It may be interesting to note in tabular form a few of the physical constants of the gases and their liquids.

SUBSTANCE	Critical temperature	Boiling-point at atmospheric pressure	Freezing-point	Color of liquid
Alcohol	+243.6° C.	+78.3° C.	—130° C.	Colorless
Ammonia	+130	— 33.7	— 75	"
Argon	—121	—187	—189.6	"
Carbon dioxide	+ 31	— 78	— 65	"
Carbon monoxide	—141	—190	—207	"
Fluorine	—120(?)	—187	....	Yellow
Hydrogen	....	—253	—258*	Colorless
Nitrogen	—146	—194.5	—214	"
Oxygen	—118	—183	....	Pale blue
Water	+358.1	+100	Zero	Colorless

* At a pressure of fifty-five millimeters of mercury.

In connection with these figures it should be stated that there are several lines of argument, based upon physical experiments, which lead scientists to believe that it is impossible for us to obtain by any physical means a temperature lower than about —273° C. This temperature is called 'absolute zero,' and the nearest approach made to it by any experiments so far performed was in one by Professor Dewar when he solidified hydrogen, obtaining a temperature only 15° above the absolute zero.

BIBLIOGRAPHY. A complete history of the subject of liquefaction of gases will be found in Hardin, *The Rise and Development of the Liquefaction of Gases* (New York, 1899). There is also an interesting article by Miss Agnes M. Clerke in the *Proceedings of the Royal Institution of Great Britain*, vol. xvi., p. 699, 1901, on "Low Temperature Research at the Royal Institution, 1893-1900."

LIQUEUR (Fr., liquor). The name given to any alcoholic preparation which is flavored or perfumed and sweetened to be more agreeable to the taste. Many of the most famous liqueurs were first made by monks as cordials for the sick, and the secret of their composition has been transmitted from one generation to another in convents and monasteries. *Aniseed cordial* is prepared by flavoring weak spirit with aniseed, coriander, and sweet fennel-seed and sweetening with clarified syrup of refined sugar. *Clove cordial*, much sold in the London gin-shops, is flavored with cloves, bruised and colored with burned sugar. *Peppermint*, a common liqueur, especially among the lower classes of London, consists of the ordinary sweetened gin, flavored with essential oil of peppermint, which is previously rubbed up with refined sugar.

Among the other commercial liqueurs, the following are the chief varieties: Absinthe, anisette, bénédictine, cassis, chartreuse, crême de menthe, crême de rose, crême de vanilla, etc., curaçoa, kirschwasser, kümmel, maraschino, noyau, pomeranzen, ratafia, trappistine, usquebaugh, vermouth. Most of these are elsewhere described under their respective names. The composition of some of the well-known liqueurs, as given by König, is shown in the accompanying table:

COMPOSITION OF VARIOUS LIQUEURS

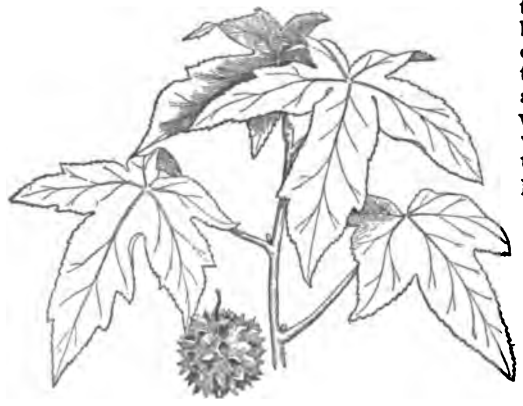
	Specific gravity	Alcohol by volume	Alcohol by weight	Extract	Cane-sugar	Other extractions	Ash
Absinthe	0.9116	58.93	......	0.18	... ...	0.32	
Bénédictine	1.0709	52.00	44.4	36.00	32.57	3.43	0.043
Ginger	1.0481	47.5	40.2	27.79	25.92	1.87	0.141
Crême de menthe	1.0447	48.0	40.7	28.28	27.63	0.65	0.068
Anisette of Bordeaux	1.0847	42.0	35.2	34.82	34.44	0.38	0.040
Curaçoa	1.0300	55.0	47.3	26.60	28.50	0.10	0.040
Kümmel	1.0830	33.9	28.0	32.02	31.18	0.84	0.058
Peppermint	1.1429	34.5	28.6	48.25	47.35	0.90	0.068
Swedish punch	1.1030	26.3	21.6	36.61			

Consult also Mew and Ashton, *Drinks of the World* (New York, 1892); and Sadtler, *Industrial Organic Chemistry* (Philadelphia, 1901).

LIQUID (Lat. *liquidus*). A consonant pronounced by the closure of the vocal organs greater than is required in the utterance of the closer vowels, but less than is demanded by the mute consonants. The liquid consonants are *l, r, w, y,* all subject to whispered aspiration.

LIQUID AIR, LIQUID HYDROGEN, etc. See LIQUEFACTION OF GASES.

LIQUIDAMBAR (Neo-Lat., from Lat. *liquidus,* liquid + ML. *ambar, ambra,* amber, from Ar. *'anbar,* ambergris). A genus of monœcious trees of the natural order Hamamelideæ, of which there are but three or four species, all in Asia and North America. The fruit, which is a globular head of two-celled capsules, contains many winged seeds only a few of which are fertile. The trees are tall and remarkable for their fragrant balsamic products. *Liquidambar styraciflua,* the American liquidambar, capatum, or sweet gum, a beautiful tree with deeply five to seven lobed leaves, is found from Connecticut south to Florida and west to Texas and Mexico. In the South, where the tree is common, it attains a height of 100 feet or more. The timber, which is often called satin walnut in the markets, is valuable. A resinous gum exudes from the tree similar in its quality to the storax of the Orient. The best-known species of the Eastern Hemisphere is *Liquidambar orientalis,* a native of Asia Minor. It is very similar to the American species.



LIQUIDAMBAR.

LIQUIDATED DAMAGES. The sum agreed upon by the parties to a contract, to be paid by either in case of his default to the other, as the measure of compensation for the loss occasioned by the breach. The law on this subject is influenced by the attitude of the courts toward 'penalties' provided for under similar circumstances, which are held void on the same principles that usury is generally prohibited. However, the right of the parties to a contract to anticipate that there may be a breach by one of them, either with or without good cause, and to estimate and determine in advance what will be a fair and reasonable compensation to the injured party, is recognized and protected by the courts. The chief concern of the courts in the interpretation of agreements is to determine whether the sum thus named is, in fact, the result of an honest effort to fix a sum which will approximately make good the loss which may be suffered in case of breach, or whether it is out of all proportion to the probable amount of damages sustained, and therefore in the nature of a penalty, and accordingly illegal and void. The courts will give great weight to the intent of the contracting parties, as far as it can be ascertained by considering the language employed by them, and the surrounding circumstances which induced them to insert such a provision. It is common to fix the amount of damages for delay in case of building operations, and it is in this class of cases that the courts have been most lenient in the construction of these stipulations. For example, if A contracts to build a factory for B, who now occupies premises the lease on which will expire in one year, and A agrees to complete the factory within that time, it is legally competent for them to provide that A shall pay B a certain sum for every day the building remains unfinished after the expiration of the time agreed upon, as B may be compelled to move from the premises he then occupies and thereby suffer great damage, and in any event the damages occasioned by the loss of the opportunity to do business in the factory planned to suit his peculiar requirements would be hard for a jury to estimate, and the determination of the parties is a safer guide. The advantage of thus fixing the damages in advance is that the aggrieved party is spared the trouble and possible expense of offering proof of the items of his damages at the trial, and that the uncertainty as to what a jury might consider adequate is avoided. Generally speaking, when damages can be easily ascertained by computation merely, and the amount named as liquidated damages is greatly in excess of that amount, or where the contract is for the payment of money only, and a sum in excess of what would be the highest rate of legal interest is fixed, the

MULBERRY AND LIQUIDAMBAR

MULBERRY (*Morus alba*).

LIQUIDAMBAR (*Liquidambar styraciflua*).

courts will regard it as a penalty. The term employed by the parties to describe a sum so fixed will not be given much weight by the courts, for obvious reasons. The courts will not disregard such an agreement merely because the sum named will be liberal compensation for the probable loss sustained, but only when it seems grossly out of proportion to the loss. However, it seems that these agreements are regarded with suspicion; as where the intention, as expressed, is ambiguous, and there is doubt as to whether the sum is to be deemed as liquidated damages or as a penalty, the courts incline toward the latter construction. See DAMAGES; PENALTY; and consult the authorities referred to under DAMAGES.

LIQUIDS, GENERAL PROPERTIES OF. See HYDROSTATICS; MATTER.

LIQUORICE. Various shrubby plants. See LICORICE.

LIQUORS (Lat. *liquor*, fluid, from *liquere*, to be fluid), FERMENTED AND DISTILLED, STATISTICS AND HISTORY OF. Alcoholic liquors are naturally divided into three groups: (1) Fermented liquors or wines, in which the sugar of fruit is converted to alcohol by simple exposure to the air; (2) malt liquors, such as beer, ale, porter, which, being mostly made from grains and starchy materials, require the preliminary process of malting, by which the starch is converted into sugar, before alcoholic fermentation is possible; (3) distilled liquors or ardent spirits, as brandy, whisky, gin, in which the fermented liquor, whether derived from fruits, grain, or other sugar-producing material, is treated to a further process of distillation, or vaporizing and condensing. That the industry is one of considerable importance is shown by the fact that during the year ending May 31, 1900, 1,198,602,104 gallons of malt liquors, 103,330,423 gallons of distilled liquors, and 23,425,567 gallons of wines were manufactured in the United States. This was produced by 2835 establishments with a combined capital of $457,674,087, and the total product was valued at $340,615,466.

WINE MANUFACTURE. Wine, being the product of natural forces and not requiring machinery for its production, is the oldest of the beverages, and was made before the dawn of history. With the cultivation of the vine and the growth of complex tastes the industry became highly developed. The wines of Greece and Rome were prepared with greatest care and often flavored with spices and herbs. Throughout the Middle Ages and in modern times the manufacture of wine has been an important industry in most European countries. The settlers of America brought with them both a taste for wine and a knowledge of its manufacture. But early attempts to introduce this industry were unsuccessful because of failure to acclimate the European vines. The successful use of a native American grape—the Catawba—marked the beginning of this industry east of the Rockies. In California, however, foreign vines were introduced and successfully cultivated by Catholic missionaries from Mexico as early as 1771, but a century passed before wine manufacture became an important industry. Of the States east of the Rockies where wine is made, Ohio, New York, and Missouri are far in the lead. By the census of 1860 the total value of the product for the United States was $400,791, of which $155,966 was from New York, and $47,275 from Ohio. By the census of 1900, the value of the product in New York was $942,548; Ohio, $801,634; Missouri, $199,130. The importance that the California industry had assumed during the forty years between these two censuses is shown by the fact that of the total product of 23,425,567 gallons produced in the United States in 1900, and valued at $2,846,148, California produced 19,028,258 gallons. The wine product of the United States is still small as compared with that of the other wine-producing countries of the world, as is shown by the accompanying figures, giving the estimated wine product of the world for 1901. See WINE.

ESTIMATED WINE CROP OF THE WORLD, FOR THE YEAR 1901

(From Advance Sheet, No. 1274, United States Consular Reports, February 25, 1902)

	Gallons
France	1,530,223,200
Italy	1,013,760,000
Spain	520,080,000
Portugal	155,760,000
Algeria	146,440,800
Austria	116,160,000
Rumania	87,120,000
Chile	87,120,000
Russia	76,560,000
Bulgaria	73,920,000
Germany	60,720,000
Argentine Republic	55,440,000
Turkey and Cyprus	50,160,000
United States	39,600,000
Peru	36,960,000
Switzerland	31,680,000
Servia	23,760,000
Brazil	12,672,000
Australia	8,316,000
Madeira	7,920,000
Tunis	4,488,000
Cape countries	3,168,000
Uruguay	2,376,000
Mexico	924,000
Persia	765,600
Bolivia	660,000
Total	4,146,753,600

CONSUMPTION OF SPIRITS IN THE PRINCIPAL COUNTRIES OF EUROPE

(Compiled from *Mulhall's Dictionary of Statistics*, 1897)

	Million gallons		Gallons per capita	
	1885	1895	1885	1895
United Kingdom	35	39	0.96	1.00
Germany	70	98	1.58	1.90
France	64	68	1.69	1.78
Austria	84	105	2.20	2.60
Russia	137	132	1.46	1.08
Scandinavia	17	17	2.10	1.90
Belgium	12	14	2.02	2.20
Holland	9	9	2.02	1.91
Italy, etc	16	18	0.25	0.25
Europe	444	500	1.22	1.30

MANUFACTURE OF MALT LIQUORS. The early history of this industry in the United States is described as follows in the Twelfth Census: "In colonial times as well as in the early decades of the nation's history, the consumption of malt liquors was relatively small and increased slowly. The wide distribution of small quantities of wine manufactured from currants or grapes, the introduction of tea, the general consumption of all classes of distilled spirits, and the household manufacture of cider and fruit brandies, satisfied the tastes of the people, and the demand for malt liquors was of slow development. Where the demand existed at all it was for ale, porter, or stout. The manufacture of lager beer in the

United States was begun about 1840. It extended with the general increase of population, the influx of German immigrants, and the cultivation of the tastes of the people for milder beverages. In 1900 its use had almost entirely superseded that of ale and porter." Since 1850 the manufacture of malt liquors in the United States has steadily and rapidly increased, the number of factories rising from 431 to 1509; the amount of capital invested from $4,072,380 to $415,284,468; and the value of product from $5,728,568 to $237,269,713. An army of nearly 40,000 wage-earners are now employed in producing this enormous annual output. Owing to the nature of the raw material required, the industry is more widely spread throughout the country than that of wine manufacture. Since, in this industry, the transportation of the finished product is more expensive than that of the raw material, the centres of manufacture are near the place of consumption; that is, in or near the large cities. In this respect the industry differs from the manufacture of either wine or distilled spirits, in both of which the cost of transporting the raw material is much greater than that of the finished product. In value of malt liquors produced, the States rank as follows: New York, Pennsylvania, Illinois, Wisconsin, Ohio, New Jersey, Missouri. See **BEER**; **BREWING**.

DISTILLED SPIRITS, WINES, AND MALT LIQUORS

QUANTITIES CONSUMED AND AVERAGE ANNUAL CONSUMPTION PER CAPITA IN THE UNITED STATES FROM 1878 TO 1900

YEAR ENDING JUNE 30	Distilled spirits consumed				Wines consumed		
	Domestic *		Imported for consumption	Total	Domestic *	Imported for consumption	Total
	From fruit	All other					
	Proof galls.	*Proof galls.*	*Proof galls.*	*Proof galls.*	*Gallons*	*Gallons*	*Gallons*
1878	1,103,351	49,600,838	1,227,752	51,931,941	17,953,386	4,310,563	22,263,949
1879	1,021,708	52,003,467	1,253,300	54,278,475	19,845,113	4,532,017	24,377,130
1880	1,005,781	61,126,634	1,394,279	63,526,694	23,298,940	5,030,601	28,329,541
1881	1,701,206	67,426,000	1,479,875	70,607,081	18,931,819	5,231,106	24,162,925
1882	1,216,850	70,759,548	1,580,578	73,556,976	19,934,856	5,628,071	25,562,927
1883	1,253,278	75,508,785	1,690,624	78,452,687	17,406,028	8,372,152	25,778,180
1884	1,137,056	78,459,845	1,511,680	81,108,581	17,402,938	3,105,407	20,508,345
1885	1,468,775	67,689,250	1,442,067	70,600,092	17,404,698	4,495,759	21,900,457
1886	1,555,994	69,295,361	1,410,259	72,261,614	20,866,393	4,700,827	25,567,220
1887	1,211,532	68,385,504	1,467,697	71,064,733	27,706,771	4,618,290	32,325,061
1888	888,107	73,313,279	1,643,966	75,845,352	31,680,523	4,654,545	36,335,068
1889	1,294,858	77,802,483	1,515,817	80,613,158	29,610,104	4,534,373	34,144,477
1890	1,508,130	84,760,240	1,561,192	87,829,562	23,896,108	5,060,873	28,956,981
1891	1,219,436	88,335,483	1,602,646	91,157,565	23,736,232	5,297,560	29,033,792
1892	1,961,062	95,187,385	1,179,671	98,328,118	23,033,493	5,434,367	28,467,860
1893	1,687,541	98,202,790	1,397,422	101,287,753	26,391,235	5,596,584	31,987,819
1894	1,430,553	88,046,771	1,063,885	90,541,209	18,040,385	3,252,739	21,293,124
1895	1,102,703	75,228,998	1,496,860	77,828,561	16,589,657	3,054,392	19,644,049
1896	1,440,810	68,069,563	1,541,504	71,051,877	14,599,757	4,101,649	18,701,406
1897	1,146,131	69,789,991	2,230,711	73,166,833	33,940,319	4,647,988	38,588,307
1898	1,411,448	79,159,590	916,549	81,487,587	17,453,684	3,113,633	20,567,317
1899	1,306,218	84,614,652	1,389,858	87,310,228	22,835,587	3,525,109	26,360,696
1900	1,386,361	94,156,023	1,705,998	97,248,382	26,492,491	3,935,000	30,427,491

YEAR ENDING JUNE 30	Malt liquors consumed			Total consumption of wines and liquors	Total consumption per capita			
	Domestic †	Imported for consumption	Total		Of distilled spirits	Of wines	Of malt liquors	Of all liquors and wines
	Gallons	*Gallons*	*Gallons*	*Gallons*	*P. galls*	*Galls.*	*Galls.*	*Galls.*
1878	317,136,597	832,755	317,969,352	392,165,212	1.09	0.47	6.68	8.24
1879	343,724,971	880,514	344,605,485	423,261,090	1.11	.50	7.06	8.66
1880	413,208,885	1,011,280	414,220,165	506,076,400	1.27.	.56	8.26	10.09
1881	442,947,664	1,164,505	444,112,169	538,882,175	1.38	.47	8.65	10.50
1882	524,843,379	1,536,601	526,379,980	625,499,883	1.40	.49	10.08	11.92
1883	549,616,338	1,881,002	551,497,340	655,728,207	1.46	.48	10.27	12.21
1884	588,005,609	2,010,908	590,016,517	691,633,443	1.48	.37	10.74	12.59
1885	594,063,095	2,068,771	596,131,866	688,632,415	1.26	.39	10.62	12.27
1886	640,746,288	2,221,432	642,967,720	740,796,554	1.26	.45	11.20	12.91
1887	715,446,038	2,302,816	717,748,854	821,138,648	1.21	.55	12.23	13.99
1888	765,086,789	2,500,267	767,587,056	879,767,476	1.26	.61	12.80	14.67
1889	777,420,207	2,477,219	779,897,426	894,655,061	1.32	.56	12.72	14.60
1890	853,075,734	2,716,601	855,792,335	972,578,878	1.40	.46	13.67	15.53.
1891	974,427,863	3,051,898	977,479,761	1,097,671,118	1.43	.45	15.31	17.19
1892	984,515,414	2,980,809	987,496,223	1,114,292,201	1.51	.44	15.17	17.12
1893	1,071,183,827	3,362,509	1,074,546,336	1,207,821 ,908	1.52	.48	16.20	18.20
1894	1,033,378,273	2,940,949	1,036,319,222	1,148,153,555	1.34	.31	15.32	16.97
1895	1,040,259,039	3,033,067	1,043,292,106	1,140,764,716	1.13	.28	15.13	16.54
1896	1,077,325,634	3,300,531	1,080,626,165	1,170,379,448	1.01	.26	15.38	16.65
1897	1,066,307,704	3,002,558	1,069,310,262	1,181,065,402	1.02	.53	14.94	16.49
1898	1,161,769,114	2,457,348	1,164,226,462	1,266,281,366	1.12	.28	15.96	17.36
1899	1,132,723,202	2,797,427	1,135,520,629	1,249,191,553	1.17	.35	15.26	16.80
1900	1,218,183,252	3,316,908	1,221,500,160	1,349,176,033	1.27	.40	16.01	17.68

* Since 1866 includes domestic spirits exported and returned. † Product less domestic exports.

NOTES.—(1) The production of domestic wines from 1871 to 1892 was estimated by the Department of Agriculture, by Mr. Charles McK. Leoser, president of the Wine and Spirit Traders' Society of New York, and other well-informed persons, and the production for 1889 (opposite the year 1890) is that officially reported by the United States Census. (2) The consumption of domestic spirituous and malt liquors was obtained from reports of the Commissioner of Internal Revenue.

MANUFACTURE OF DISTILLED LIQUORS. The history of this industry in the United States is

FERMENTED LIQUORS AND DISTILLED SPIRITS PRODUCED, AND THE QUANTITY OF DISTILLED SPIRITS TAX PAID FOR CONSUMPTION, FROM 1875 TO 1900

(From Reports of the United States Commissioner of Internal Revenue)

YEAR ENDING JUNE 30	Production of fermented liquors	Production of distilled spirits, exclusive of brandy, distilled from fruit				
		Bourbon whisky	Rye whisky	Alcohol	Rum	Gin
	Barrels †	*Tax. galls.*	*Tax. galls.*	*Tax. galls.*	*Tax. galls.*	*Tax. galls.*
1875	9,452,697	....	....	....	....	....
1876	9,902,352	....	....	....	....	....
1877	9,810,060	....	....	....	....	....
1878	10,241,471	6,405,520	2,834,119	10,277,725	1,603,376	364,963
1879	11,103,084	8,587,081	4,001,048	19,594,283	2,243,455	372,776
1880	13,347,111	15,414,148	6,341,991	21,631,009	2,439,301	394,668
1881	14,311,028	33,632,615	9,931,609	22,988,969	2,118,506	549,596
1882	16,952,085	29,575,667	9,224,777	15,201,671	1,704,084	569,134
1883	17,757,892	8,662,245	4,784,654	10,718,706	1,801,960	545,768
1884	18,998,619	8,896,832	5,089,958	12,385,229	1,711,158	641,724
1885	19,185,953	12,277,750	5,328,043	13,436,916	2,081,165	639,461
1886	20,710,933	19,318,819	7,842,540	11,247,877	1,799,952	656,607
1887	23,121,526	17,015,034	7,313,640	10,337,035	1,857,223	747,025
1888	24,680,219	7,463,609	5,879,690	11,075,639	1,891,246	872,990
1889	25,119,853	21,960,784	8,749,768	10,939,135	1,471,054	1,029,968
1890	27,561,944	32,474,784	13,355,577	11,354,448	1,657,808	1,202,940
1891	30,497,209	29,931,415	14,345,389	12,260,821	1,784,312	1,293,874
1892	31,856,626	29,017,797	13,496,827	14,490,987	1,956,318	1,338,617
1893	34,591,179	40,835,873	16,702,240	12,250,380	2,106,765	1,424,490
1894	33,362,373	15,518,349	10,026,544	10,570,070	1,864,595	1,287,977
1895	35,589,784	18,717,153	12,321,543	8,819,923	1,777,083	1,176,669
1896	35,859,250	16,935,862	9,153,066	9,960,301	1,490,228	1,098,376
1897	34,462,822	6,113,726	4,269,220	9,503,353	1,294,157	1,159,314
1898	37,529,339	13,439,459	8,818,240	11,672,795	1,340,547	1,267,579
1899	36,697,634 ‡	17,256,331	10,792,565	11,974,354	1,494,379	1,266,823
1900	39,471,593 ‡	19,411,829	14,296,568	10,735,771	1.614,514	1,597,081

YEAR ENDING JUNE 30	Production of distilled spirits, exclusive of brandy distilled from fruit *				Production of fruit brandy, including apple, peach, and grape	Total production of distilled spirits	Distilled spirits other than fruit brandy (tax paid for consumption)
	High wines	Pure neutral, or cologne spirits	Miscellaneous	Total			
	Tax. galls.	*Tax. galls.*	*Tax. galls.*	*Tax. galls.*	*Tax. galls.*	*Tax. galls.*	*Tax. galls.*
1875	....	....	....	60,930,425	1,757,202	62,687,627	62,668,709
1876	....	....	....	57,959,647	672,221	58,631,868	57,840,472
1877	....	....	....	59,912,268	1,527,141	61,439,409	56,516,248
1878	19,412,985	11,108,023	4,096,342	56,103,053	1,239,403	57,342,456	49,600,838
1879	18,033,652	13,459,486	5,600,840	71,892,621	995,752	72,888,373	52,003,467
1880	15,210,389	20,657,975	8,265,789	90,355,270	1,023,147	91,378,417	61,126,634
1881	14,363,581	23,556,608	10,586,666	117,728,150	1,799,861	119,528,011	67,426,000
1882	10,962,379	27,871,293	10,744,156	106,853,161	1,430,054	107,283,215	70,759,548
1883	8,701,951	28,295,253	10,502,771	74,013,308	1,281,202	75,294,510	75,508,785
1884	6,745,688	28,538,680	11,426,470	·75,435,739	1,095,428	76,531,167	78,479,845
1885	3,235,889	27,104,382	10,811,757	74,915,363	1,489,711	76,405,074	67,689,250
1886	2,396,248	26,538,581	10,543,756	80,344,380	1,504,880	81,849,260	69,295,361
1887	2,410,923	27,066,219	11,084,500	77,831,599	1,601,847	79,433,446	66,168,859
1888	1,016,436	29,475,913	12,603,883	70,279,406	1,408,782	71,688,188	70,677,379
1889	1,029,495	30,439,354	13,738,952	89,358,510	1,775,040	91,133,550	75,868,671
1890	555,572	34,022,619	14,652,180	109,275,928	1,825,810	111,101,738	83,535,206
1891	1,007,070	35,356,126	19,983,382	115,962,389	1,804,712	117,767,101	87,254,001
1892	633,590	37,690,835	16,204,570	114,769,041	3,667,465	118,436,506	93,084,725
1893	449,209	37,577,052	17,305,773	128,651,782	2,358,548	131,010,330	97,458,348
1894	126,506	35,377,115	14,434,336	89,205,492	2,948,159	92,153,651	87,346,834
1895	209,699	21,062,216	15,865,309	79,949,595	1,960,176	81,909,771	74,453,039
1896	198,299	25,564,738	22,187,833	86,588,703	3,403,852	89,992,555	67,039,910
1897	206,739	16,877,306	23,041,833	62,465,648	1,813,427	64,279,075	68,833,231
1898	174,124	20,613,205	23,436,264	80,762,213	2,906,198	83,668,411	78,353,301
1899	420,833	25,876,229	27,983,051	97,064,565	3,097,769	100,162,334	83,819,314
1900	249,743	24,173,671	33,405,523	106,484,700	3,760,487	109,245,187	93,500,840

* No returns of the production of the different kinds of spirits other than fruit brandy were made prior to July 1, 1877.

† Of not more than 31 gallons.

‡ Includes fermented liquors removed from breweries for export free of tax.

not characterized by the steady growth which marks the other two branches of alcoholic industries. The number of distilleries reported in 1850 was 968, and in 1900, 967. The amount of capital engaged in the industry, however, was only $5,409,334 in 1850, as against $32,550,604 in 1900, and the value of the output was $15,770,240, as against $96,798,443 in 1900. The number of employees in 1850 was about 4000, while in 1900 it was 286 less. The distilleries were scattered among twenty-eight States, among which Illinois ranked first in amount of product, Kentucky second, and Indiana, Ohio, Pennsylvania, and Maryland followed, in the order named. North Carolina, with the very small output of 599,540 gallons, ranked first in the number of establishments. A large amount of distilled liquor is consumed each year in the arts and sciences, and also in the manufacture of medicines. On the other hand, a large amount is produced every year in illicit distilleries, of which, of course, no record is possible. Taking these and other considerations into account, it was estimated that the quantity consumed as a beverage by the people of the United States during 1900 was about 91,000,000 gallons, or a per capita consumption of approximately 1.20 gallons.

See Alcohol; Distilled Liquors; Rum; Whisky; etc.

LIQUOR TRAFFIC. See Temperance.

LIRA, lē′rȧ (It., from Lat. *libra*, pound). An Italian silver coin of greater or less value, according to time and place. The Tuscan lira was equal to 80 French centimes; the Austrian lira or *zwanziger* was of about the same value. The present lira of the Italian Kingdom is equal to the French franc (about $0.193), and is divided into 100 centimes.

LIRIA, lē′rē-ȧ. A town of Spain, in the Province of Valencia, and 12 miles northwest of Valencia (Map: Spain, E 3). The plain in which it stands is planted with vines and olives. Near by are vestiges of the ancient Edeta. There are mineral springs in the neighborhood. Population, in 1900, 8839.

LIR′IODEN′DRON. A genus of plants. See Tulip-Tree.

LISA, LIZA, LIZITA. Names in the Spanish West Indies for various mullets. See Mullet.

LISAINE, lē′zȧn′, Battle of. An engagement in the Franco-Prussian War, which raged for three days (January 15-17, 1871) on the small river Lisaine, near the French fortress of Belfort (q.v.). Gambetta, hoping to withdraw the Germans from around Paris by a diversion in Southern Germany, ordered Bourbaki to threaten the enemy around Belfort, and to attempt an inroad into Baden. The German general, von Werder, retreated before Bourbaki and took up a position along the Lisaine, in order to defeat this plan. Bourbaki, with 120,000 men, made desperate efforts to drive the Germans from their position, but the latter were so strongly fortified, and the French soldiers were so weak from lack of food and labored marches, that these efforts were without avail. Surrounded on three sides by the victorious Germans, the remnants of the French army, 85,000 in number, crossed the border line into Switzerland, February 1st.

LISBOA, lās-bō′ȧ, João Francisco (1812-63). A South American author, born at Iguará, Maranhão, Brazil. He studied at one of the colleges at Rio de Janeiro, and became a journalist. He edited various newspapers, including the *Cronica* (1838-41), and the *Jornal de Timon* (1852-58), which he wrote as well as edited himself. It contained historical and political papers criticising both sides, although he was of the Liberal party. He was clerk to the Secretary of the Government from 1835 until 1838, and took an active part in politics. Afterwards he devoted himself to historical research and went to Lisbon, Portugal, where he died. His works include: *Vida do Padre Antonio Vieira* (1874); *Historia do Maranhão* (1850); and several in manuscript.

LISBON, lĭz′bŭn (Port. *Lisboa*). The capital of Portugal and of the Province of Estremadura, situated on the north shore of the estuary of the Tagus, 7 miles from the ocean; latitude 38° 43′ N., longitude 90° 11′ W. (Map: Portugal, A 3). The estuary is here about 1½ miles wide, but immediately above the city it widens into a large lake from 4 to 8 miles wide, forming one of the best harbors of Europe, with deep water both in the lake and through the narrow entrance, which is defended by fortifications. The city stretches along the coast for five miles, and rises in a succession of terraces, its houses mingling with the green foliage of its parks, the surrounding district being dotted with villas. The city proper is divided into four parts, the old town, the *Alfama*, in the east; the new town, or the *Cidade Baixa*, in the middle and on the low ground next to the Tagus; the *Bairro Alto* on the heights to the north, and *Alcántara* in the west. It is not fortified on the land side, and straggles off in long avenues bordered with villas toward the plateau of Estremadura.

The old town is built around a hill surmounted by the Castello de São Jorge, an old Moorish castle now used as barracks and military prison. This was the only part of the city not destroyed by the great earthquake of 1755. It still has a number of Moorish and Roman remains, and its streets are narrow and crooked, besides being steep and ill-paved. There are a large number of churches in this section, many of them very old, especially the Sé Patriarchal, or cathedral, which dates from the twelfth century. The new town, to the west of the old town, is regularly laid out with wide streets crossing at right angles, and traversed by numerous street railways. Facing the river-front is the largest square in the city, the Praça do Commercio, surrounded by public buildings and containing a large statue of King Joseph I. in the centre. On the west side of the square are the general post-office and the naval arsenal; on the east are the exchange and the custom-house, and on the north are two ministerial buildings and the city hall. From this plaza extend eight parallel streets to the north, the one in the centre being entered through a triumphal arch, and all of them terminating at the Praça de Dom Pedro IV., with a statue of that monarch and two bronze fountains. Running northwest from this praça is the largest and finest promenade in the city, the Avenida da Liberdade, which is one mile long and 300 feet wide, with a double row of shade-trees along the middle. It passes near the Botanical Garden, one of the finest in Europe, containing a superb collection of tropical plants, and inclosing also the polytechnic school and the astronomical observatory. Half a mile to the west is the beautiful Estrella Garden, opposite the Estrella Church, the most conspicuous building in the city, with a white marble cupola, and two bell-towers that can be seen for many miles around. Still farther to the west, and within the limits of the *bairro* of Alcântara, stands the royal palace, with its fine park, the Tapada das Necessidades; and from here the road crosses the Alcântara River into the suburbs of Belem and Ajuda, forming the extreme western part of the city.

Lisbon has a medical school, a normal school, several high schools, schools of commerce, agriculture, and navigation, academies of art and music, several museums, scientific academies and societies, and the national public library, containing over 200,000 volumes, about 10,000 manuscripts, and a large collection of coins. Among public works should be mentioned the two aqueducts, one 15, the other 70 miles long, which supply the city with abundant and pure water. The sewerage system is excellent, and the city is one of the cleanest in Europe. It has manufactures of jewelry, musical instruments, woolen, cotton, and silk fabrics, gloves, hats, shoes, paper, soap, and chemicals, and various other articles; it has also sugar-refineries, iron-foundries, and machine-shops. Commercially Lisbon has the natural advantages of harbor and geographical position that should make it a leading centre of traffic. Its trade is principally with England, Brazil, and the African colonies. The chief imports are grain, sugar, cotton, tobacco, coal, petroleum, and timber; the chief exports, cork, wine, olive oil, salt, fruits, and fish; besides, Lisbon is an important port of transit for colonial wares. In 1887 extensive harbor improvements, including the construction of several large docks, were begun, which render the commercial outlook very promising. The population was, in 1890, 308,000, and in 1900, 357,000.

Lisbon was called *Olisipo* by the ancient Lusitanians; the Visigoths changed the name to *Olisipona*, and the Moors to *Lishbuna*, whence the present name. It is said to have been founded by the Phœnicians, and was the flourishing capital of Lusitania when first visited by the Romans. It was taken by the Moors in 716 and held by them till 1147, when it was recaptured by Alfonso I. with an army of Crusaders, mostly Englishmen. During the centuries of Portuguese exploration Lisbon rose to a high position of commercial supremacy. It lost this position during the Spanish occupation (1580-1640). On the 1st of November, 1755, the city was visited by a frightful earthquake, which laid the greater part of it in ruins and killed 30,000 to 40,000 persons. Its rapid recovery was due largely to the energy of the Prime Minister, the Marquis of Pombal. In 1807-08 the city was occupied by the French.

LISBON. A village and the county-seat of Columbiana County, Ohio, 51 miles north by west of Wheeling, W. Va.; on the Beaver River, and on the Erie Railroad. It has a public library of 3300 volumes. The village is of considerable importance as the centre of a productive section engaged in farming, mining, and sheep-raising, and has various manufacturing industries. The water-works are owned by the municipality. Population, in 1890, 2278; in 1900, 3330.

LISBURN, lĭz′bûrn. A market-town and cathedral city on the Lagan, partly in the County of Antrim, partly in the County of Down, Ireland, eight miles south-southwest of Belfast (Map: Ireland, E 2). It is a clean and well-ordered town, with a convenient market, and considerable manufactures of fine linens and damasks. Its parish church is the cathedral of Down, Connor, and Dromore. A noteworthy feature of the town is the monument to Jeremy Taylor, who was bishop of that see, and died at Lisburn in 1667. Lisburn originated in the erection of a castle, in 1610, by Sir Fulk Conway, to whom the manor was assigned in the settlement of James I.; but its importance dates from the settlement of a number of Huguenot families, who, after the revocation of the Edict of Nantes, established themselves at Lisburn, where they introduced the manufacture of linen and damask, after the machine fabricating methods employed in the Low Countries. Population, in 1891, 12,250; in 1901, 11,460.

LISCO, lĭs′kō, EMIL GUSTAV (1819-87). A German theologian. He was born in Berlin and was educated there and at Bonn. From 1845 to 1887 he was pastor of different churches in Berlin, and he became known as one of the most distinguished of its liberal preachers and theologians. He took a prominent part in the liberal Church movement, and was one of the founders of the Berlin Union and the Union of the German Protestants. In 1872 he was severely reprimanded by the Consistory for his publication of *Legendenhafte Bestandteile in dem apostolischen Glaubensbekenntnis* (1872). He also published *Berlin und der Protestantismus* (1870-73) and *Der Glaube an den Heiligen Geist* (1860).

LISCOW, lĭs′kō, CHRISTIAN LUDWIG (1701-60). A German author, born at Wittenburg, Mecklenburg-Schwerin. He studied law at the universities of Rostock, Jena, and Halle. In 1741 he entered the Saxon civil service, where he attained the rank of counselor in 1745. Liscow is considered one of the best German prose writers before Lessing. He attracted much attention by his essay *Die Vortrefflichkeit und Notwendigkeit der elenden Skribenten* (1736). He republished his different satirical writings collectively, under the title *Sammlung satirischer und ernsthafter Schriften*, in 1739.

LISIEUX, lē′zyẽ′ (Lat. *Noviomagus*). A town in the Department of Calvados, France, situated on the Touques, 118 miles by rail west-northwest of Paris (Map: France, G 2). It is noted for its Gothic Church of Saint Pierre, which dates chiefly from the twelfth and the thirteenth centuries, and has numerous objects of art, mostly mutilated, however. The Church of Saint Jacques (1496-1501) contains some fine mural paintings. The episcopal palace, built during the seventeenth and eighteenth centuries, is now used as a courthouse and contains a small collection of modern French paintings. Lisieux has numerous private houses in Mediæval and Renaissance styles and remains of an old Roman building, probably a theatre. The chief educational institutions are the communal college, a seminary, and a library of about 28,000 volumes. Textiles are the chief manufactures, and the trade is principally in agricultural products. Prior to the conquest of the Gauls Lisieux was the capital of the Lexovii. It was the seat of a bishop from the sixth century to 1790. Population, in 1891, 16,261; in 1901, 16,084.

LISLE, ALICE (c.1614-85). An Englishwoman, wife of the regicide John Lisle. On the charge of harboring John Hickes, a traitor, whom she knew only as a Dissenter, she was tried before Judge Jeffreys, who forced the jury to convict her. She was condemned to be burned, but this sentence was commuted, and she was beheaded September 2, 1685.

LISLE, lēl, GUILLAUME DE (1675-1726). A French geographer, born in Paris. He devoted himself to the study of cartography from an early age and produced a large number of maps marked by a correctness of treatment far above the general geographical knowledge of the time. Besides purely geographical works he published a large number of maps in connection with editions of voyages of discovery and exploration. In 1702 he was elected to the Académie des Sciences and in 1718 was made royal geographer.

LISMORE, lĭz-mōr′. An island of Argyllshire, one of the Inner Hebrides, 6 miles from Oban (Map: Scotland, C 3). It is noted for its antiquities: the parish church, formerly the choir of a cathedral; the remains of the Achinduin castle, the ancient residence of the bishops of Argyll; and the ruins of Castle Rachal, a Scandinavian fort. Population, about 500.

LISOLA, lē'zō'lä', **François Paul**, Baron (1613-74). An Austrian diplomat, born at Salins in Franche-Comté. He began his diplomatic career in 1639, when he went to London as Ambassador to persuade Charles I. to reinstate the Count Palatine. In 1655 he was sent to Sweden to effect peace with the Poles, but having failed to attain this, he induced the Emperor Ferdinand III. to conclude an alliance with them. When Ambassador in Poland he brought about the reconciliation of that country with the Elector Frederick William of Brandenburg, and at the same time established a union between this Prince and the Emperor. In 1660 Lisola took part in the peace negotiations at Oliva, and after 1667 his great effort was to form a coalition against Louis XIV., whose plans he described and denounced in his famous pamphlet, *Le bouclier d'état et de justice contre le dessein de la monarchie universelle* (1667). It is also due to his exertions that an alliance was established between Austria and Holland in 1672, in which union Spain also joined the following year. A more detailed account of the life and work of Lisola is to be found in Reynald, "Le Baron de Lisola; sa jeunesse et sa première ambassade en Angleterre," in the *Revue historique* (vol. 27, Paris, 1885), and Pribram, *Franz Paul Freiherr von Lisola (1613-74) und die Politik seiner Zeit* (Leipzig, 1894).

LIS PENDENS (Lat., suit pending). A term employed to describe the doctrine or principles of law whereby persons not parties to an action are deemed to have constructive notice of the pendency of the action in case they purchase or acquire an interest in the subject-matter involved during the course of the litigation. The doctrine is a very old one in the English law, and was early expressed in the maxim *pendente lite nihil innovetur* (pending the action nothing should be changed). It was adopted to prevent the intervention of new rights to property in dispute which might complicate and prolong the litigation.

LIS'SA (anciently *Issa*, Slav. *Vis*). An island in the Adriatic Sea, off the Dalmatian coast, and belonging to Dalmatia. It is 10 miles long, 5 miles broad, and has an area of 38 square miles. Its shores are steep and rocky, and it is accessible at only a few bays. The soil is not fertile. The chief products are wine and oil. The population of the island in 1900 was 9918. Its two harbors are strongly fortified. Lissa, or San Giorgio, on the northeast shore, is the principal town and seaport, with a population of 5261. Issa was an ancient Greek colony, and became later an important naval station for the Roman fleet. Off Lissa the Austrians under Admiral Tegethoff defeated the Italians under Admiral Persano July 20, 1866.

LISSA (Pol. *Lészno*). A town in the Province of Posen, Prussia, 47 miles by rail from Posen (Map: Prussia, G 3). It has a palace with a park, an old town hall, a gymnasium, and a municipal slaughter-house. It has manufactures of wines, liquors, bricks, and cigars, and considerable trade in cereals. Population, in 1890, 13,116; in 1900, 14,282. The town formerly belonged to the Polish noble family of Leszczynski and became in the seventeenth century the centre of the Bohemian Brothers, who transferred there their educational institutions and their archives.

LISSAJOUS (lē'sȧ'zhōōz') **FIGURES**. A name given to certain phenomena designed to show optically the composition of vibratory motions. On April 6, 1857, Jules Antoine Lissajous presented to the Academy of Sciences in Paris a memoir on the optical study of vibratory movements, wherein he set forth for the first time that series of peculiar curves which have since borne his name, and which are generated by the combination of two vibrations taking place in the same plane, but at right angles to each other.

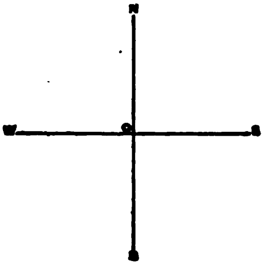


Fig. 1.

Suppose a body is vibrating back and forth between E and W, Fig. 1, in simple harmonic motion, when an impulse is given to it which alone would set it into similar vibration between N and S. Assume that the time of vibration of the two motions is the same, then the result of their combination will depend upon the relative 'phase' of the two vibrations. Several characteristic cases may be considered as typical of the real infinity of possible variations. If the body tend to start from O toward E at the same instant that it tends to start from O toward N, then its real motion would be along the diagonal of the rectangle on OE and ON, and the resulting vibration would be as shown in Fig. 2 *a*. This is the case where both harmonic cycles start at the same instant from the position of equilibrium, O; that is, the difference of phase is zero. If it tend to start from O toward N and W simultaneously, then the resulting vibration will be shown at Fig. 2 *e*. In this case the EW motion would have executed a half cycle when the NS commences, that is, the phase difference is one-half.

For a phase difference of one-quarter the body would be at E when the NS motion starts and the result is shown in Fig. 2 *c*. A phase difference of three-quarters would put the body at W when the other motion starts and the figure would be the same as *c* except that it would circulate in the opposite direction.

The result of a phase difference of one-eighth is shown in *b*, and that of three-eighths in *d*. If the amplitude of the two motions be the same it is evident that Fig. 2 *c* would be a circle. A small weight or plumb-bob hanging upon a string serves very well to illustrate the above forms of compound vibration.

When the rates of vibration or periodic times of the two components are unequal much more complex results are produced, which, however, reduce to comparative simplicity when the rate of one bears a simple ratio to the rate of the other. When the two rates are in the ratio of 1 to 2 there results a series of curves some of which are shown in Fig. 3, for phase differences of one-eighth, one-fourth, three-eighths, and one-half of the EW motion. Similarly Fig. 4 shows the corresponding curves when the rates of vibration are in the ratio of 2 to 3.

Lissajous attached a small mirror to one prong of each of two tuning-forks of the same pitch. One fork is mounted vertically, F_1, Fig. 5, and the other horizontally, F_2. A ray of light from the lamp, L, is made to fall first on the mirror of the vertical fork, thence upon that of the horizontal fork, and finally on the screen S. If F_1 alone vibrates, then the spot of light on the screen will move up and down, owing to the tilting of the mirror on that fork. If F_2 is the only one in motion the spot will move horizontally; and finally if both vibrate simultaneously, then a combination curve will be exhibited, similar to some one of the forms of Fig. 2. If the two forks have different rates of vibration then complex curves will appear; if one is the octave of the other, it will be of the class of Fig. 3; and Fig. 4 would be given by two forks having the interval of the fifth. In another form of apparatus for the same purpose the forks are replaced by two steel springs the rates of which can be varied by their length and by a small adjustable weight. Fig. 6 illustrates another method of showing these forms of vibration. The plumb-bob D is free to swing perpendicular to the plane of the paper around the line AB with an effective length of the pendulum of CD; in the plane of the paper it can only swing around E with the effective length DE. By means of the sliding clamp E it is possible to adjust the two rates of vibration to definite ratios and then the bob D will execute some one or all of the above curves. Many other methods have been devised for showing or drawing these curves.

FIG. 2.

a b c d e

FIG. 3.

a b c d e

FIG. 4.

a b c d e

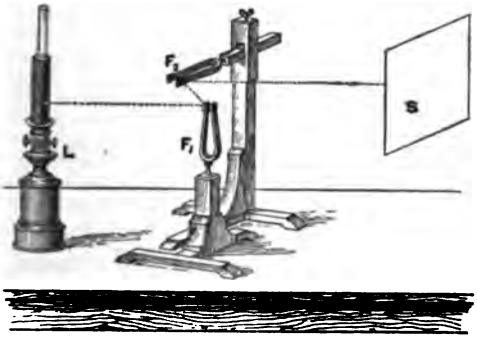


FIG. 5.

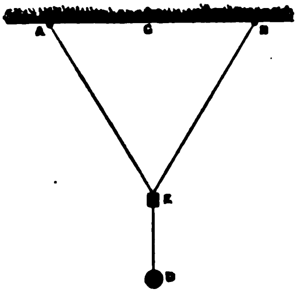


FIG. 6.

LIST, list, **FRIEDRICH** (1789-1846). A German economist. He was born at Reutlingen in Württemberg. He was the son of a well-to-do tanner, but, as he had no taste for his father's trade, he entered the public service as a clerk and rose rapidly until in 1816 he attained the position of ministerial under-secretary. In 1817 he was appointed professor of political economy at Tübingen, but with the fall of the Ministry which he supported he was forced in 1819 to resign his professorship. He was elected member of the Diet of Württemberg, but was expelled in 1822 for his censure of the acts of the Government, and was condemned to ten months' imprisonment. He escaped, however, seeking refuge successively in Baden, Alsace, and Switzerland. In 1825 he came to Pennsylvania, where he tried farming, but soon abandoned it to become editor of a German paper in Reading. In 1827 he published a pamphlet entitled *Outlines of a New System of Political Economy*, in which he defended the doctrine of protection. The discovery of coal upon his property placed him in easy circumstances and he turned again toward Germany, having received an appointment as United States Consul at Hamburg. But on his arrival in Europe in 1830 he found that the Senate had failed to confirm his appointment, and though about 1833 he was appointed Consul at Leipzig, he was *persona non grata* to the Saxon Government and held the post for a short time only. At this time he was much interested in the establishment of railroads, and his insistence upon their advantages led to the building of the road between Leipzig and Dresden, and contributed to the further development of the German system. He was tireless in his advocacy of protection and railroads, and in the formation of associations of manufacturers for the cultivation of the influence of this class. In 1837 he went to Paris, where he wrote several letters for the Augsburg *Allgemeine Zeitung*, which were published in 1841 in a volume under the title of *Das nationale System der politischen Oekonomie.* In 1843 he established at Augsburg the *Zollvereinsblatt*, in which he advocated a national commercial system and a national fleet. He visited Austria and Hungary in 1844, and England in 1846, for the purpose of forming a commercial alliance between Germany and that country, in which his efforts were not successful. Depressed by the failure of his plans, the loss of his health and property, he shot himself in a fit of insanity. For his biography, consult: Goldschmidt (Berlin, 1878), and Jentsch (ib., 1901); also *Friedrich List, ein Vorläufer und ein Opfer für das Vaterland* (Stuttgart, no date; anonymous). See also article "Friedrich List" in Palgrave, *Dictionary of Political Economy* (London, 1894-99).

The chief contribution of List to economic thought is contained in *Das nationale System der politischen Oekonomie*. In this work he emphasizes the idea that the economic policy of a nation should be such as to develop all of its resources, thus placing it in a position of independence. To this end he defended a protective system as necessary for a nation which has not developed its industry and commerce, although he regarded free trade as the goal toward which all nations should tend. He advanced few ideas in defense of protection which had not already been advanced by Alexander Hamilton, with whose work he was presumably familiar; he was, moreover, much indebted to A. Müller for his ideas.

LISTA Y ARAGON, lĕ′stȧ ē ä′rȧ-gōn′, Alberto (1775-1848). A Spanish poet and critic, born in Ariana, near Seville. Educated at the University of Seville, he showed wonderful ability in mathematical studies and became professor of mathematics at the age of fifteen, and six years after taught in the College of San Telmo. He became a priest at the age of twenty. In 1808 he received the chair of rhetoric and poetics in the University of Seville and showed political independence in his *Semanario patriótico*. But when the French left Spain in 1813 Lista had to go, too, and did not return until 1817. In 1820 he became head of the College of San Mateo, but his teachings were not acceptable to the Church, and he was again forced to leave the country in 1823. He returned in 1833 and was made editor of the *Gaceta de Madrid*, and in 1837 professor of higher mathematics at Madrid. Then he spent two years in the College of San Felipe Neri in Cadiz and in 1840 retired to Seville. His *Poesias* (1822 and 1837) mark him as one of the greatest Spanish lyrists of the early part of the century. His *Canto del esposo*, an imitation of the Song of Solomon, is probably the best of his lyrics. As a critic he showed a classic taste and a clear and correct style in *Ensayos literarios y críticos* (1844) and *Lecciones de literatura dramática española* (1839). He collected *Trozos escogidos de los mejores hablistas castellanos en prosa y verso*; rewrote Ségur's *Histoire universelle*, under the title *Curso de historia universal*; continued (1828) the *Historia de España*, written by Mariana and Miñana; and wrote a *Tratado de matemáticas puras y mixtas*.

LISTEMANN, lĭs′te-män. A family of German-American musicians. Fritz (1839—) was born at Schlotheim, Thuringia; studied the violin under David at the Leipzig Conservatory, and, after having been chamber-virtuoso to the Prince of Schwarzburg-Rudolstadt, went in 1867 to New York. In 1871 he became first violin of the Thomas Orchestra; in 1874 a member of a Boston sextet (Philharmonic Club); in 1878 first violin of the Philharmonic Orchestra; and from 1881 to 1885 held a like position in the Symphony Orchestra. He then devoted himself to teaching.—His brother, Bernhard (1841—), was born in Schlotheim, and studied the violin under David, Vieuxtemps, and Joachim. He was concert-meister at Rudolstadt (1859-67), and then came to the United States with Fritz, and was connected with the same organizations as was his brother. In 1881 he founded the Listemann String Quartet, and in 1893 became the head of the violin department at the Chicago College of Music.—His two sons, Paul (1871—) and Franz (1873—), were also excellent musicians, the former being a violinist, the latter a 'cello virtuoso. Paul was a member of his father's organization, studied under Brodsky and Hilf (Leipzig) and Joachim (Berlin), was leader of the Pittsburg Orchestra (1895) and the American Orchestra (New York, 1896), and then became soloist of the Redpath Grand Concert Company. Franz studied under Fries and Giese (Boston), Klengel (Leipzig), and Hausmann (Berlin). He was for one year first 'cellist of the Pittsburg Orchestra and then settled in New York as a 'cellist and teacher.

LIS′TER, Sir Joseph, Baron (1827—). An English surgeon, father of modern antiseptic surgery. He was born at Upton, Essex, the son of Joseph Jackson Lister, and received his early education at a school for Friends. Entering the University of London, he took his degree in arts in 1847, and in medicine in 1854, and became Fellow of the Royal College of Surgeons in England in the same year, and of Edinburgh in 1855. He studied at Edinburgh in 1856 and was soon made assistant surgeon and lecturer on surgery at that university. He then became successively professor of surgery at Glasgow, professor of clinical surgery at Edinburgh and at King's College Hospital, London, and was then made surgeon to the Queen. Lister's earliest labors were in histology. His first investigations were directed toward proving the existence of ordinary unstriped muscle-fibres in the iris. He made in addition many important observations on the early stages of inflammation and the coagulability of the blood. From the first he taught that pus in wounds was due to the decomposition of blood and serum, brought about in some way by the atmosphere, and insisted on scrupulous cleanliness and the use of deodorant solutions in his surgical wards. It was not, however, until the work of Pasteur on *Fermentation and Putrefaction* appeared that he fully realized that the formation of pus was due to bacteria. He at once set himself to apply the principles of antiseptics to the treatment of wounds, and the development of those principles revolutionized modern surgery. Lister has been the recipient of many honors, both at home and abroad. In 1880 both Oxford and Cambridge conferred the degree of LL.D. upon him; he was made a baronet in 1883 and a peer in 1897. He received the medal of the Royal Society in 1880. His more important publications are: *Remarks on a Case of Compound Dislocation of the Ankle, with Other Injuries, Illustrating the Antiseptic System of Treatment* (Edinburgh, 1870); *On the Effects of the Antiseptic System of Treatment upon the Salubrity of a Surgical Hospital* (Edinburgh, 1870); *A Contribution to the Germ Theory of Putrefaction and Other Fermentative Changes* (Edinburgh, 1875). See Antiseptics.

LISTON, John (c.1776-1846). An English comic actor, of whose early history nothing is known, save that he studied at Soho. He taught school for a time, was entirely unsuccessful in his first appearance on the stage as an amateur, and after some experience in tragic parts, playing at times with Mrs. Siddons, he discovered his comic powers. Despite his nervous and melancholy nature, he was very successful in old-man rôles, and afterwards as a clown. His dancing was good, and gradually he made himself a favorite with the London audiences. In 1823 he removed from Covent Garden to Drury Lane, and in 1837 retired from the stage. During his last years his mind failed rapidly. Liston's gravity of deportment added much to his comic force, and he was highly praised by Lamb, Matthews, Colman, and by Leigh Hunt, who considered his rustics much better than his old men. The best rôles of Liston were Paul Pry, of which his treatment has become a tradition, Polonius, Slender, Bottom, Bob Acres, Bombasto Furioso, Apollo Belvie in Hook's *Killing No Murder*, Jacob Gawky in *The Chapter of Accidents*, and Grizzle in *Three and Deuce*. His wife, whom he married in 1807, was a tiny woman, famous for her Queen Dollalolla in O'Hara's *Tom Thumb*.

LIS'TON, Robert (1794-1847). A Scotch surgeon, born at Ecclesmachan, in the County of Linlithgow. He studied anatomy at Edinburgh, and was made a surgeon to the Royal Infirmary. In 1835 he became professor of clinical surgery at University College, London. The skill and the rapidity with which he performed serious operations acquired for him a wide European reputation and an extensive surgical practice in London. His most important works are his *Elements of Surgery* (1831), and *Practical Surgery* (1837), the latter of which passed through several editions.

LISTOWEL, lĭs-tō'el. A town of Perth County, Ontario, Canada, on the Maitland River, 54 miles northeast of London. It is an important railway junction on the Grand Trunk Railway, and has a considerable grain trade. Population, in 1891, 2587; in 1901, 2693.

LISZT, lĭst, Franz (1811-86). A famous Hungarian pianist and composer. He was born at Raiding, near Oedenburg, in Hungary, October 22, 1811, and began his musical education at the age of six years. After three years' instruction he surprised his friends by playing a difficult concerto in public. The evidences of his genius were so patent that his father organized further concerts, which not only enhanced the boy's musical reputation, but gained for him many important friends and patrons among the Hungarian nobility. It was by means of their financial support that the young pianist was enabled to spend six years, completing his education, at Vienna, to which city his family removed in 1821. His teachers were the celebrated Czerny (piano) and Salieri (theory), men of strong artistic personality, who undoubtedly supplied the ballast that enabled him to resist the musical trickery in composition which at first beset his work. After a few public concerts in 1823, he and his father journeyed to Paris, with the view of securing for the boy admission to the Paris Conservatory, which, however, was refused him, owing to an old rule which excluded all foreigners. He, however, studied theory for a time under Paer and Reicha. His first operetta, *Don Sancho ou le château de l'amour*, was produced in 1825. Two years later his father died, upon which he gave up his concert work, and settled as a teacher in Paris. Contemporary critics described him as 'a pianist, the most extraordinary and fascinating ever known, and one of the most wonderful of improvisators.' His early piano compositions were in the style and fashion of the period, and were largely paraphrases upon popular or fashionable operas, in which art was frequently sacrificed to a sort of trickery, whole passages being so written as to be practically impossible to any one but himself. He met with immediate success as a teacher, the aristocratic patrons and friends of his boyhood rallying to him, and enabling him to satisfy every social as well as musical ambition. The appearance of Paganini in Paris in 1831 inspired him to become as great a virtuoso on the piano as that master was on the violin. He was of a peculiarly impressionable temperament, and was in turn strongly affected by the political happenings of the period, the ceremonialism of the Church, the genius of Beethoven, Weber, Chopin, Berlioz, Schumann, and Wagner; besides which he experienced several affairs of the heart, the most serious of which was his *liaison* with the authoress 'Daniel Stern' (the Countess d'Agoult). Together they retired to Geneva (1835), where three children were born to them, two daughters and a son. Cosima, the youngest of the daughters, married first Hans von Bülow (1857), and, after separating from him in 1869, became the wife of Wagner, of whom her father was a mighty champion. In 1839 he reappeared in public with signal success, his only serious competitor being Thalberg (q.v.), whom he easily outrivaled. In 1849 he became kapellmeister to the Grand Duke of Weimar, a post which he relinquished in 1861. Four years later he took minor orders in the Catholic Church, and was subsequently known as the Abbé Liszt. During his period of service at Weimar occurred the really great events of his life. He was enabled to discover, help, and introduce many artists of whom the world came to be proud; he advanced most thoroughly the school of music to which he belonged, and which has since been described in the history of music as the New German School, whose characteristic was a freedom from the old classical rules of tonality and form. Here also he began his second period of composition, by which alone he is to be judged as a composer. His work was now characterized by his own individuality as a creative artist, and marked by the inherent mysticism of his nature. He took up orchestral instrumentation and the classic symphony where his great predecessors had left it, and evolved the symphonic poem, in which the emotions and their portrayal are of more importance than the prescribed forms of the classic symphony or overture. While the symphonic poem was akin to the symphony in style, it was smaller in extent, and had no pause between the movements—which latter were bounded or divided according to the emotional moods and demands of the subject or story under treatment. In brief, the fundamental laws of form were adhered to, but not the conventional formulæ. Perhaps the most eventful incident connected with his stay at Weimar was his introduction and championship of Wagner and his work. He produced *Lohengrin* in 1850, and revived *Der Fliegende Holländer* and *Tannhäuser*. He also presented notable works of Raff, Schumann, and Berlioz. In 1875 he became president of the Hungarian Academy of Music at Pesth, between which city, Weimar, and Rome he spent the last few years of his life. With the passing of time critical musical opinion has come to be widely divergent regarding the value of his work and his place in the list of great composers. By many much of his work is considered to be not altogether free from charlatanism; but, contradictory as the differing estimates may be, he is unhesitatingly conceded to have been a man of genius. As a pianist he has never been excelled. Besides this Liszt gave to the world a method of technique and interpretation by which the piano became almost as eloquent as the orchestra. Thematic catalogues and lists of his many compositions are plentiful. He wrote chiefly for the piano, although toward the end of his life orchestral and religious compositions were in the majority. Few great men have been more loyal to their friends and convictions than was Liszt, and still fewer have been as greatly beloved by their contemporaries, or as highly honored by the world. His writings include: *Lohengrin et Tannhäuser de Richard Wagner* (1851); *Frédéric Chopin* (1852); *Ueber Fields Notturnos* (1859); *Robert Franz* (1872); and, most important, *Des Bohémiens et de leur musique en Hongrie* (1859). He died in the midst of a Wagner festival at Bayreuth, July 31, 1886. Consult: Ramann, *Franz Liszt als Künstler und Mensch* (Leipzig, 1894), the best biography; Von Lenz, *Great Piano Virtuosos* (New York, 1899); Amy Fay, *Music Study in Germany* (New York, 1880), an excellent personal sketch; and, for a critical appreciation, Huneker, *Mezzotints in Modern Music* (New York, 1899).

LI TAI PEH, lē tī pĕ (c.700-763). A Chinese poet, sometimes called Li Po. Born in a far western province, he became a member of a bacchanalian group of six young poets, wandered here and there, and, if we are to credit legend, spent several years in the mountains writing, singing, and drinking with his comrades. About 742 he went to the capital and became a client of the great minister Ho Shi Chang, and later a Court favorite of the Emperor Ming Hwang. But he was forced to flee from the palace because of intrigue, or possibly merely because of the dislike of the Emperor's favorite wife. According to Chinese story, he was drowned one night as he reached to kiss the moon's reflection at the side of his boat—plainly a materialization of one of his dainty conceits. More probably he died under the protection of Li Yang Pang after receiving Imperial forgiveness for his many attempts against the dynasty. One of the most popular of Chinese poets, Li Tai Peh is called the *prince of poetry*, the *great doctor*, and the *immortal who loved wine*. His poetical skill was versatile and his subjects were varied. Much of his poetry has a touch of Anacreon, but in all there is a keen appreciation of the beauties of nature and most of all of the beautiful moon. Some selections are translated in Giles, *Chinese Literature*, p. 152 seq. (London, 1901), and in d'Hervey de Saint-Denys, *Poésies de l'époque des Thang*, pp. 1-72 (Paris, 1862).

LITANY (Lat. *litania*, from Gk. *λιτανεία*, *litaneia*, entreaty, from *λιταίνειν*, *litainein*, to entreat, from *λίτεσθαι*, *litesthai*, to pray, from *λιτή*, *litē*, prayer). In general, a solemn act of supplication addressed to God with the object of averting His anger, and especially on occasions of public calamity. Through all the varieties of form which litanies have assumed, one characteristic has always been maintained—viz. that the prayer alternates between the priest or other minister, who announces the object of each petition, and the congregation, who reply in a common supplicatory form, the most usual of which was the well-known "Kyrie eleison!" (Lord have mercy!). In one procession which Mabillon describes, this prayer, alternating with "Christe eleison," was repeated 300 times; and in the capitularies of Charlemagne it is ordered that the 'Kyrie eleison' shall be sung by the men, the women answering "Christe eleison." From the fourth century downward, the use of litanies was general. The *Antiphonary* of Saint Gregory contains several. In the Roman Catholic Church three litanies are especially in use—the "Litany of the Saints" (which is the most ancient), the "Litany of the Name of Jesus," and the "Litany of Loreto." Of these, the first alone has a place in the public service books of the Church, on the rogation days, in the ordination service, the service for the consecration of churches, the consecration of cemeteries, and many other offices. Although called litany of the saints, the opening and closing petitions, and indeed the greater part of the litany, consist of prayers addressed directly to God; and the prayers to the saints are not for their help, but for their intercession on behalf of the worshipers. The Litany of Jesus consists of a number of addresses to Him under His various relations to men, in connection with the several details of His passion, and of adjurations of Him through the memory of what He has done and suffered for the salvation of mankind. The date of this form of prayer is uncertain, but it is referred, with much probability, to the time of Saint Bernardino of Siena, in the fifteenth century. The Litany of Loreto, so called because it has for ages been solemnly sung every Saturday in the chapel of the Holy House at Loreto, resembles both the above-named litanies in its opening addresses to the Holy Trinity, and in its closing petitions to the "Lamb of God, who taketh away the sins of the world;" but the main body of the petitions are addressed to the Virgin Mary under various titles, some taken from the Scriptures, some from the language of the Fathers, some from the mystic writers of the mediæval Church. The litany in the prayer-book of the English Church, although it partakes of ancient forms, contains no invocation of the Virgin or the saints. It is divided into four parts—invocations, deprecations, intercessions, and supplications—in which are preserved the old form of alternate prayer and response.

LITCH'FIELD. A borough and one of the county-seats of Litchfield County, Conn., 30 miles west of Hartford; near Bantam Lake, the largest lake in the State, and on the Shepaug, Litchfield and Northern Railroad (Map: Connecticut, C 2). It has beautiful parks, and many places of historic and scenic interest. The borough is the centre of large dairying interests, and there are some manufactories, supplied with water-power from the outlet of Bantam Lake, and nickel-smelting works, the vicinity having valuable deposits of nickel ore. Population, in 1890, 1058; in 1900, 1120.

Litchfield was settled as 'Bantam' in 1719, and several years later its present name was adopted. During the Revolution it was used for a time as a depot of supplies, and in 1776 the statue of George III., which on July 9 was torn down on Bowling Green, New York, was sent here, and was melted and cast into bullets by the women of Litchfield. The first law school in the United States was founded here in 1784 by Judge Topping Reeve, who conducted it until his death in 1823. Many of the most eminent jurists and statesmen of the country, including five Cabinet ministers—Calhoun, Woodbury, Mason, Clayton, and Hubbard—were trained here. In 1792 Miss Sarah Pierce opened in Litchfield the first institution in America for the higher education of women. Lyman Beecher was pastor of the Congregational church from 1810 to 1826, and it was in Litchfield that both Henry Ward Beecher and Harriet Beecher Stowe were born. Litchfield was also the birthplace of Ethan Allen, and the home for many generations of the distinguished Wolcott family. Consult; Kilbourne, *Sketches and Chronicles of the Town of Litchfield* (Hartford, 1859); the *Litchfield Book of Days* (Litchfield, 1900); and an article by Kilbourne, in the *Connecticut Quarterly*, vol. ii. (Hartford, 1896).

LITCHFIELD. A city in Montgomery County, Ill., 52 miles northeast of Saint Louis, Mo.; on the Chicago, Peoria and Saint Louis, the Cleveland, Cincinnati, Chicago and Saint Louis, the Illinois Central, the Chicago, Burlington and Quincy, the Wabash, and other railroads (Map: Illinois, C 4). It has a public library and parks; and there is an abundance of coal, natural gas, and oil in the vicinity. Mining and manufacturing are the leading industries, the principal industrial establishments being manufactories of mine engines and railroad cars, flour-mills, brick and tile plants, foundries, glass-works, and briquet-works. Litchfield, incorporated in 1859, is governed by a mayor, elected every two years, and a unicameral council. Population, in 1890, 5811; in 1900, 5918.

LITCHFIELD. A village and the county-seat of Meeker County, Minn., 65 miles west of Minneapolis; on the Great Northern Railroad (Map: Minnesota, D 5). It is of considerable importance as the commercial centre of a grain and live-stock region, and has several grain elevators, foundry and machine-shops, and manufactures of flour, lumber, woolen goods, carriages and wagons, bricks, gloves, etc. Population, in 1890, 1899; in 1900, 2280.

LITCHI, or **LEECHEE**, lĕ′chĕ′ (Neo-Lat., from Chin. *lichi*), *Nephelium Lit-chi*. A large evergreen tree of the natural order Sapindaceæ, native of China and the Malay Peninsula, and extensively grown in many tropical countries. It is highly prized for its fruit, which is said to be one of the most delicious known. It is cultivated in the West Indies, and attempts have been made to introduce the trees in Florida, but with little success, as the tree is very susceptible to injury by cold and thrives only in the extreme southern part of the State. It is reported as tolerant of the conditions found in parts of southern California. The fruit is a nut an inch or more in diameter, which consists of a thin, rough, brittle shell within which is a sweet pulp surrounding a hard seed. The pulp separates readily from the seed and is eaten fresh, dried, or as a sort of preserve. In the dried state the nuts keep a long time, and it is mostly in this form that they are found in commerce. Chinese and Japanese stores usually keep them in stock. The fruit is principally used as a confection, sugar being one of the chief constituents of the pulp. Fruits of other species of Nephelium resemble the litchi and are used in a similar manner. The principal ones are the rambutan (*Nephelium lappaceum*), which has a bright red fruit covered with soft spines; and the longan (*Nephelium Longana*), a tree of moderate size and fine appearance, which is readily cultivated, the fruit of which is smaller and inferior to the litchi.

LITCHI.

LIT DE JUSTICE. See Bed of Justice.

LITER. See Metric System.

LITERARY PROPERTY. Property in ideas, expressed in written or printed language. Literary property, as defined by Drone, is "the exclusive right of the owner to possess, use, and dispose of intellectual productions," and copyright is "the exclusive right of the owner to multiply and dispose of copies of an intellectual production." The English statute (5, 6 Victoria) defines copyright to mean "the sole and exclusive liberty of printing or of otherwise multiplying copies of any subject to which the word is herein applied." The American statute (U. S. Rev. Stat., sec. 4952) speaks of copyright in a book as "the sole liberty of printing, reprinting, publishing, . . . and vending the same."

Property in an intellectual production, comprising the exclusive right of multiplying for sale copies of literary or of art productions, is of comparatively recent date. Whatever theories might have been held during the time of the Roman State in regard to the rightfulness of the claim of the author to enjoy the usufruct of all the copies of his production, the manifest impossibility of securing, under the conditions then obtaining, by any process of law or any application of the authority of the State, the control of such usufruct, prevented the lawyers of the time from giving any serious attention to the question. In these earlier discussions as to the nature of property in ideas, special attention was given to the question whether such property should take precedence over that in the material which happened to have been utilized for the expression of the ideas. The jurist Tribonian, who was selected by Justinian to supervise the preparation of the Justinian Code, followed an opinion of Gaius (given about A.D. 150), which, having reference to the ownership of a certain table upon which a picture had been painted, gave the table to the artist. This decision contains an unmistakable recognition of immaterial property, not, to be sure, in the sense of a right to exclusive reproduction, but in the particular application that, while material property depends upon the substance, immaterial property, that is to say property in ideas, depends upon the form.

Apart from the difficulty of preventing the 'appropriation' of their literary productions, the feeling on the part of the Roman writers that authorship was not in itself a worthy vocation, but was to be considered simply as a pastime, unquestionably stood in the way of arrangements under which authors secured compensation for their productions, and doubtless postponed for a considerable period the recognition by the publishers and by the reading public of any property rights in literature. It appears from the letters of Cicero, Horace, Martial, and others, that they made a profit from the sale of their writings.

The scanty references which can be traced in the Latin literature of the first century to the relations of the authors with the booksellers appear, as might be expected, almost exclusively in the writings of the society poets. For the centuries following the destruction of the Roman Empire, during which literary undertakings were confined almost entirely to the monasteries, the Roman usage, under which authors could dispose of their works to booksellers and the latter could be secure of some commercial control of the property purchased, was entirely forgotten. No restrictions were placed on the duplication of works of literature. The statutes of the University of Paris, issued in 1223, provided that the booksellers of the university were to produce duplicate copies of all the texts authorized for the use of the university. There is evidence of payments being made to the university scholars whose services were utilized in annotating these texts and in correcting the work of the copyists. The difficulty and expense attending the reproduction of manuscript was then much greater than in the early days of the Roman Empire. When, therefore, an author desired to secure for his works a wide circulation, he came to regard the reproduction not as a reserved right and source of income, but as a service to himself which he was very ready to facilitate and even to compensate. Throughout the Middle Ages, whatever immaterial property in realms of science or of art obtained recognition and protection was held in ownership not by individuals, but by churches, monasteries, or universities. The writers of the Middle Ages were satisfied when they could succeed under any conditions in getting their productions before the public.

The printing-press brought with it the possibility of a compensation for literary labor. Very speedily, however, the unrestricted rivalry of printers brought into existence competing and unauthorized editions, which diminished the prospects of profit, or entailed loss, for the authors, editors, and printers of the original issue, and thus discouraged further undertakings. As there was no general enactment under which the difficulty could be met, protection for the authors and their representatives was sought through special 'privileges' obtained for separate works as issued. The earliest privilege of the kind was that conceded by the Republic of Venice in January, 1491, to the jurist Peter of Ravenna, securing to him and to the publishers selected by him the exclusive right for the printing and sale of his work *Phœnix*. No term of years was named in this privilege. The larger number of the earlier Italian enactments in regard to literature were framed not so much with reference to the protection of authors as for the purpose of inducing printers (acting also as publishers) to undertake certain literary enterprises which were believed to be important to the community. The Republic of Venice, the dukes of Florence, and Leo X. and other popes conceded at different times to certain printers the exclusive privilege of printing for specific terms (rarely exceeding 14 years) editions of classic authors; not so much to secure profits for the printers, but simply to encourage, for the benefit of the community, literary ventures on the part of the editors and printers.

In France, from the reign of Louis XII. to the beginning of the sixteenth century, it became the usage for the publisher (who was also the printer) before undertaking the publication of a work, to obtain from the King an authorization or letter patent, the term of which varied according to the nature of the work, and also to the mood of the monarch or of the advising ministers. The status of literary property was further recognized and defined by the so-called *Ordinances de Moulins* of Charles IX. in 1566, and the letters patent of Henry III. in 1576, but the general method under which copyrights were granted and were defended remained practically the same. These royal letters were for the most part in the earlier years, as had been the case in Italy, issued for the protection of special editions of the classics. They were concerned, therefore, not with the protection of original ownership, but with the encouragement of investments on the part of the printer-publishers in scholarly undertakings. In so far as these editions included original work (in connection with the revision or annotation of the texts), this work had been paid for by the publishers, who stood, therefore, in the place of the original workers. The National Assembly in 1789 abolished all royal privileges that were still in force for the protection of works of literature. In July, 1793, the first general copyright act was passed. This gave protection to the author during his life and to his heirs and assigns for ten years thereafter. The Imperial act of 1810 extended the term in behalf of the author and his widow for life, and of their children for twenty years. The law of March 28, 1852, prohibited the production in France of unauthorized editions of foreign works. The law of April 8, 1854, increased the term in behalf of the children to thirty years, while the act of July 14, 1866, increased the period of protection in behalf of heirs to fifty years after the death of the author. The decree of the 9th of December, 1857, declared the copyright legislation of France applicable to the French colonies named, and subsequent copyright legislation was made applicable in all the colonies by the decree of October 29, 1887. Later amendments have had to do simply with details. The provisions apply equally to foreigners and to Frenchmen, and no restriction is made as to the author's residence at the time the copyright is taken out. In case the work be first published abroad, copyright in France may be secured subsequently by the deposit of two copies with the Minister of the Interior or with the Secretary of the Prefecture in the departments. The most important modifications of this act have been in connection with the Convention of Bern of 1886-87, and the Convention with the United States in 1891, reference to which will be made later.

The earliest German privilege of which there is trustworthy record was issued in 1501 by the Aulic Council to an association entitled the *Sodalitas Rhenana Celtica*, for the publication of an edition of the dramas of Hroswitha of Gandersheim, which edition had been prepared for the press by Konrad Celtes. These dramas had been written about 985. This Hroswitha privilege, while later than the early Venice privileges, antedates by two years the first instance in France, and by seventeen years the first in England. After 1501 there is a long series of Imperial privileges issued directly by the Imperial Chancellor in the name of the Emperor. In 1512 an Imperial privilege was issued to the historiographer John Stadius, for all that he should print, the first European privilege which was made to cover more than a single work or which undertook to protect books not yet published. An Imperial patent of 1685 uses the terms (as if in antithesis to each other) 'A privileged book' and 'A book purchased from its author.' Later we find references to 'privileged' and 'non-privileged' books, under the latter being understood original works by contemporary writers. Pütter (who may be called the father of the modern theory of property in literary productions), writing in 1774, uses for the unprivileged books the term *eigenthümlich* (individual) and for the privileged the term *nicht-eigenthümlich* (non-individual). Literary piracy in Germany began almost at once with the invention of printing. Before manuscript copies had been replaced by printed books, the possession of a manuscript was held to carry with it the right to make copies of the same *ad libitum*. As a natural consequence of this practice, the possession of a printed copy of a work was for a considerable time also believed to carry with it the right to make and dispose of further printed copies, and the first upholders of an author's copyright found themselves obliged to contend against the claim of 'ancient precedent.' Early in the history of the German book trade, there arose, however, a practice among the leading publishers of respecting each other's undertakings, irrespective of any privileges or of other legal protection given to the works in question. To this practice there were, of course, numerous exceptions, but it exercised nevertheless, during the period previous to the existence of a national copyright system, an important influence in indicating the tendency of the book trade and that of the reading public to a recognition of and a respect for literary property. It also placed the publishers in a better position to make satisfactory payments to the authors or editors employed by them. The many important publications of Koberger of Nuremberg, whose business activity dated from 1473, were issued entirely without privilege, and with a few exceptions were not interfered with by rival publishers. In 1532 the magistrates of Nuremberg, acting on behalf of the widow of Albert Dürer, enjoined Hans Güldemund from reëngraving the *Triumphwagen* and selling impressions of his plate. In the same year these magistrates cautioned all the booksellers of Nuremberg against keeping in stock or selling any copies of a certain unauthorized edition of Dürer's *Instruction in Perspective*. Under the order of the magistrates of the city of Basel, issued in October, 1531, printers of books in that city were enjoined for a period of three years, under the penalty of 100 gulden, from reprinting or pirating the books of one another. Until nearly the end of the eighteenth century, the protection of literary property in Germany depended upon a system of privileges, Imperial or local, but these privileges were for the most part concerned simply with the property interests of the publishers and printers, but a small proportion of them having to do with modern books or with the rights of living authors. Such privileges covered at the outset three classes of literary undertakings: first, official publications —a term including in the earlier times the service books of the Church and school text-books, as well as the authorized text of Government edicts, laws, and enactments; secondly, editions of works taken from the body of the world's literature (*literarisches Gemeingut*), i.e. the first printing (*Vordruck*) of the same; and third, new books presenting the first consideration of a specific subject, more particularly of a scientific, technical, or practical nature. For this last class of undertaking, the recipient of the privilege claimed a control not only of the specific book which he had produced or of which he was the owner, but the monopoly for the time being, within the district covered by the privilege, of the subject considered in such book. The writer who had produced a book on "The Use of Herbs," or the publisher who had employed a writer to prepare such a book (the subject not having been treated before or at least not recently), would consider himself aggrieved and would contend that his rights had been infringed, if within the same territory the publication of another book on herbs should be permitted. If the privilege covered an edition of a Latin author, the holder believed himself authorized to prevent the publication, within the territory covered by his privilege, of any other edition of the same author, even though such competing edition might, in respect to the revision of the text and to the editorial work in the notes and commentaries, be entirely distinct from his own. Local privileges of this kind, which undertook to give to the possessor an exclusive control, during a certain term, for a specified classic text, were, of course, practically identical with the trade monopolies, also characteristic of the age, which were conceded for the sale, within specific terrritories, of articles such as salt or wool.

In 1794, legislation was inaugurated in the Prussian Parliament which was accepted by the other States of Germany (excepting Württemberg and Mecklenburg), under which all German authors and foreign authors whose works were represented by publishers taking part in the book fairs in Frankfort and Leipzig, were to be protected throughout the States of Germany against unauthorized reprints. This Berlin enactment may be credited as the first step toward a practical recognition of international copyright. It proved, however, difficult, at least until after 1815, to enforce the provisions of these interstate enactments.

The first copyright privilege in England bears date 1518 and was issued to Richard Pynson, King's printer, the successor, second in line, to Caxton. The privilege gives a monopoly for the term of two years. The date is fifteen years later than that of the first privilege issued in France. In 1530, a privilege of seven years was granted to an author in consideration of the value of his work. This is cited by Scrutton as the first record of an English copyright issued to an author. Royal privileges continued to be issued during the sixteenth century, while, after 1556, the entries in the registers of the Stationers' Company are made evidence of the exclusive rights to the persons named for printing the books specified. The Stationers' Company, in giving title to property in a 'copy' or literary production, acted as the representative of the authority of the Crown, an authority secured to it through royal charter. The control of the work of the Stationers was, in 1637, placed in the hands of the Star Chamber. The replacing in 1640 of the absolutism of the Star Chamber by the absolutism of the Long Parliament made no change in the completeness of the authority left with the Stationers' Company. The Parliamentary Ordinances of 1641, in prohibiting printing or importing without the consent of the owner of the 'copies' of said books, constituted a clear statutory recognition of property in 'copy,' a recognition evidently resting upon an understanding of its existence under the common law. The act of 1643 for "redressing disorders in printing," and the licensing act of 1662, while having for their main purpose the control of literature in connection with its influence on politics, continued to affirm or to imply the existence of property in the "copy' of books. The English authorities on the subject, Maugham, Coppinger, Scrutton, and others, and the American Drone, are at one in the opinion that at the close of the seventeenth century it was the general understanding in England that authors possessed in their productions a perpetual right of property and that this right could be assigned. This understanding, upon which were based Parliamentary acts for regulation and for license, and in accord with which were carried on important and continued business undertakings, marked a development in the conception of literary property which had not then been reached elsewhere. The Act of Queen Anne, which went into effect in 1710, under which a statutory protection for a term of fourteen years was given to the author of a literary production (with provision that if he were alive at the expiration of that period, his copyright could be extended fourteen years), brought to a close, for Great Britain, the period of common-law copyright. This result was probably not intended by the legislators who framed the act and was certainly not anticipated by the publishers at whose instance the matter had been taken up and who were simply applying for a more specific and more effective protection, covering such term as Parliament might see fit to grant, for the property in their 'copies,' of the existence of which property there had as yet been no question. It was, in fact, not until 1769 that any serious contention was raised against the continued validity of copyright at common law. In that year, the common-law right was maintained in the decision rendered in the famous case of Millar *vs.* Taylor, a decision rendered the more noteworthy because it was concurred in by Lord. Mansfield, the greatest authority on the subject of copyright whom Europe had thus far known. In 1774, in the case of Donaldson *vs.* Becket, the issue was raised for the second time, the property involved being the same in each suit, the copyright of Thomson's *Seasons*. In this case the House of Lords reversed its previous decision. Its conclusions were in substance: first, that an author had a common-law right to his production before publication (ten judges in the affirmative and one dissenting); second, that, after publication, such common-law right still rested in the author (eight judges in the affirmative and three in the negative); third, that, under the statute of 1710, the author had lost his right of action at common law and retained protection for his copyright only during the term prescribed by the statute (six judges in the affirmative and five in the negative); fourth, that the right at common law possessed by the author and his assigns prior to 1710 had been a right in perpetuity (seven judges in the affirmative, four in the negative). In each of these votes, including that of the vital issue of the effect upon the common-law right of the statute of 1710, Lord Mansfield was recorded in favor of the continued right of the author at common law, and of the perpetuity of copyright, irrespective of the effect of this statute. The effect of this decision was, as said, to replace what may be called the common-law period of a copyright in England by a copyright protection limited to the terms of the successive statutes.

The copyright law now in force in Great Britain is in substance that of 5 and 6 Vict., c. 45, enacted in 1842, with amendment of 1862 for paintings and photographs. Exclusive right to perform dramatic pieces is given by the statute of 1833. Sculpture is provided for under the act of 1813. See COPYRIGHT.

The copyright act was the result of a Parliamentary movement initiated by Sergeant Talfourd, conducted later by Lord Mahon. Under Talfourd's bill of 1841 it was proposed to extend the term of copyright to a period of sixty years from the death of the author. The principal opponent of this longer term was Macaulay, at that time a member of the House. Macaulay's views prevailed, and the Talfourd bill was defeated. The term finally arrived at was that suggested by Macaulay, and it was also at his instance that the provision was added against a possible suppression of books by the owners of the copyright.

In the United States the first act in regard to copyright was passed in Connecticut in January, 1783. This was followed by the acts of Massachusetts, Maryland, New Jersey, New Hampshire, and Rhode Island, later in 1783, and before May, 1786, all of the other original States, except Delaware, had passed similar acts. These acts were due more particularly to the efforts of Noah Webster, and their first service was the protection of his famous *Speller*. Webster journeyed from State capital to State capital to urge upon Governors and Legislatures the immediate necessity of copyright laws, and his persistent efforts were crowned with success. The necessity for State laws on the subject was, however, obviated by the United States statute of 1790. Previous to the adoption, in 1787, of the Federal Constitution, a general copyright law was not within the province of the central Government, and in order to encourage the States in the framing of copyright legislation, a resolution, proposed by Madison, was adopted in Congress in May, 1783, recommending to the States the adoption of laws securing copyright for a term of not less than fourteen years, with right of renewal for fourteen years more. Certain of the State acts granted longer terms. The act of 1790, however, provided for the double term suggested by Madison. The act of 1831 extended the fourteen years to twenty-eight, with the privilege to the author, his widow, or the children, of renewal for fourteen years more. The statute law relating to copyright is to be found in *U. S. Rev. Stat.*, Tit. 60, Chap. 3 (1874), with later amendments, of which those of March, 1891, introduced international provisions. (See COPYRIGHT.) Under the interpretation of the United States courts, copyright in published works exists only by virtue of the statute, while in the works that have not been published, such as compositions prepared for dramatic representation, the copyright obtains through the common law. The United States decision which still serves as a precedent on the point of statutory limitation of copyright is that of the United States Supreme Court in 1834 in the case of Wheaton *vs.* Peters. This decision involved the purport of the United States law of 1790, and the determination of the same question that had been decided by the House of Lords in 1774; viz. whether copyright in a published work existed by the common law, and if so whether it had been taken away by statute. The Court held that the law had been settled in England, the act of 8 Anne, Chap. 21, having taken away any right previously existing at common law; and that the copyright statute of 1790 did not affirm a right already in existence, but created one; and finally, that there was no common law of the United States in force. Justices Thompson and Baldwin, in opposing the conclusions of the four justices concurring in this decision, took the ground that the common law of England *did* prevail in the United States, that copyright at common law had been fully recognized, and that even if it were admitted that such copyright had been abrogated in England by the statute of Anne, such statute had, of course, no effect either in the colonies or in the United States. In 1880, in the case of Putnam *vs.* Pollard, it was claimed by the plaintiff that the decision in Wheaton *vs.* Peters could, in any case, only make a precedent for Pennsylvania; that the English common law obtained in the State of New York, and could not have been affected by the statute of Anne; but the New York Supreme Court decided that Wheaton *vs.* Peters constituted a valid precedent.

INTERNATIONAL COPYRIGHT. The first country to take action in regard to international copyright was Prussia, which in 1836 passed an act conceding the protection of the Prussian statute to the writers of every country which should grant reciprocity. In 1837 a copyright convention was concluded between the different members of the German Confederation. This was confirmed in 1870 between the States which were then brought together in the newly constituted German Empire. In 1838 an act was passed in England under which the Crown might, by order in council, grant the privilege of copyright to authors of books first published in any foreign country, to be named in such order, provided always that "due protection had been secured by the foreign Powers so named for the benefit of parties interested in works first published in British dominions." Under this act Great Britain entered into copyright conventions with Saxony, 1846; Hanover, 1847; France, 1851; Prussia, 1855; Belgium, 1855; Spain, 1857; Sardinia, 1862; and Italy, 1867. Interstate conventions were also arrived at during the same period between most of the literature-producing States of Europe, the noteworthy exceptions being Belgium (which profited largely through the unauthorized reprinting of books originating in France), Holland, and Hungary. In 1887, under the Bern Convention, the States of Europe and certain States outside of Europe united in a copyright system which protected, throughout the territory of the States that were party to the convention, the works produced in each of these States. The States taking part in this international union comprised at the outset Great Britain (including the British colonies), Germany, France, Belgium, Spain, Italy, Switzerland, Haiti, and Tunis. Since 1887 the following States have come into the union: Luxembourg, Monaco, Montenegro, Norway, Japan, and Denmark. The most noteworthy exceptions, among the literature-producing countries, to membership in the convention are Holland, Russia, Austria-Hungary, and the United States. In 1896 a diplomatic conference met in Paris to discuss a revision of the Bern Convention, and drew up a modification known as the Act of the 4th of May, 1896. The association maintains a permanent bureau at Bern, and under its initiative conferences have been held at brief intervals through the action of which the provisions of the Union have been perfected. In 1901 the International Publishers' Association established at Bern a permanent bureau whose work is carried on in coöperation with that of the Bern Convention.

In the United States efforts to secure international copyright relations extended over a period of more than fifty years. In 1837 Henry Clay presented to Congress a petition of British authors asking for American copyright. In 1843 George P. Putnam presented to Congress a memorial drafted by himself, and signed by ninety-seven publishers and printers, in which it was stated that "the absence of an international copyright was alike injurious to the business of publishing, and to the best interests of the people at large." In 1841 was organized the first International Copyright Association, of which George P. Putnam was the secretary. Between that date and 1891 fourteen copyright measures were introduced into Congress. In 1887 the American Copyright League, composed in the main of the authors of the country, appointed an executive committee to take action to further the measures then pending in behalf of international copyright. Of this committee Mr. R. U. Johnson was, during the greater part of its activity, the secretary. In the same month was organized the American Publishers' Copyright League, with W. H. Appleton as president, and G. H. Putnam as secretary. In 1891 was finally secured the enactment of the bill, drafted under the direction of the Publishers' League, which made such modifications in the existing statute as to concede copyright in the United States to the authors of foreign States in which American authors were placed in a position to secure similar copyright protection. The most important limitations in the copyright as granted in the act of 1891 were the requirements that the foreign book to secure protection of the American statute must be produced from type set within the limits of the United States, and that two copies of the book so produced must be deposited in the Library of Congress not later than the date of publication of the work, in this or any foreign country. The requirement that the work of an American author should, in order to secure copyright in this country, be manufactured in this country was new. While, through the passage of the act of 1891, the United States had finally put itself on record in company with the other civilized and literature-producing and literature-consuming States of the world in recognizing the property rights of literary producers, it was not in a position to accept membership in the Convention of Bern. The requirement that the copyrighted book must be manufactured in this country, coupled with the requirement for simultaneous publication, made conditions which were incompatible with the regulations accepted by the Bern Association. This additional measure for securing American copyright for aliens (and, under reciprocity, foreign copyright for Americans), a measure which is the result of fifty-three years of effort on the part of individual workers and of successive copyright leagues, brings this country to the point reached by France in 1810, and by Great Britain and the States of Germany in 1836-37. Imperfect as the act may be as judged by the present standards of international copyright legislation, it not only marks a great advance in the development of public opinion and legislative opinion in this country, but has resulted in substantial gains for the authors of America, for the authors of Great Britain, and for the American book-buying public.

The results of this act have not proved wholly satisfactory. As far as it concerned authors whose books originated in a language other than English, the act has produced no real benefit. The authors of France, Germany, and Italy—States which are in direct intellectual relations with the United States, and whose governments have accorded to American writers the same copyright protection as it secured for their own authors—secure copyright in form, but not in fact. The difficulty of inducing American publishers to make investments in American editions of Continental books is not obviated because of the fact that the American law does not place the publishers in a position to protect themselves against unauthorized competing editions. Since the copyright secured for a translation of a book not copyrighted in this country in the original text would cover only the particular version, a piratical competitor might produce, in case the work should prove a success, another version reaping the advantage of the literary judgment and of the advertising contributed by the original and authorized publisher. As a result, the production of American editions of Continental works has, since the act of 1891, been inconsiderable. Foreign authors secured but trifling returns from American readers, for the simple fact that they secured very few readers, and American readers failed to obtain the advantage of a knowledge of current Continental literature, the reading of which would have widened their general cultivation and have helped to lessen international prejudice. The law has thus deprived American publishers, and all who have a business interest with these publishers in the trade of book-manufacturing, of the opportunity of making legitimate profit from the production of American editions of the works of Continental authors. The law has also proved defective in the provisions relating to the protection of works of art, provisions which were framed some time in advance of the development of important methods of art production, and in its failure to extend the term of copyright with a view to securing for the producers of intellectual property the control for their productions during their own lifetime, and of preserving for their heirs the enjoyment of the results of these productions during a reasonable term after the death of the producer. The United States should not have been satisfied with according to literary producers a smaller term of protection than is considered advisable by any other civilized State excepting Greece.

The diverse theories in regard to literary property which, in the shaping of the copyright legislation of the world, have come into discussion may be briefly summarized as follows: First, property in an intellectual conception or creation is analogous to property in a material creation, and implies as comprehensive and unlimited a control for the production as that conceded by the community to other classes of productions; second, intellectual property depends upon an individual agreement or convention, to which each person enjoying the use of a copy of a literary or artistic production makes himself a party; third, property in an intellectual production depends upon the natural or personal rights of the author, who, through unauthorized appropriations, may suffer an injury or tort; fourth, property in an intellectual production is the creation of statute, and is subject to limits depending not upon the natural rights of the producer, but upon the convenience or advantage of the community.

Of these several theories or conceptions, it is the fourth which represents in substance the survival of discussions of two centuries, and which has formed the basis of the copyright legislation of both Europe and America.

For further particulars as to the copyright legislation now in force in the United States and elsewhere, see the title Copyright, and consult the authorities there referred to.

LITH′ARGE. See Lead.

LITHERLAND, lĭth′ẽr-l*a*nd. A manufacturing town in Lancashire, England, 4½ miles north of Liverpool (Map: England, D 3). Population, in 1891, 4500; in 1901, 10,600.

LITHIC ACID DIATHESIS (from Gk. λιθικός, *lithikos*, relating to stone, from λίθος, *lithos*, stone); Uric Acid Diathesis; Lithæmia; Lithuria. An excessive production of lithic (or uric) acid and its salts in the body, coincidently with which there is lessened alkalinity of the blood, rendering that fluid less able to hold the acid and its salts in solution. The latter thus become deposited in various tissues, particularly in the joints and the spleen. Sufferers from this condition of things are said to have the lithic acid diathesis. Their urine is of a dark golden color and is more acid, of higher specific gravity, and less abundant than the urine of health. It deposits urates on cooling, and it may contain albumen or traces of sugar. The output of uric acid is low.

There is a motley group of symptoms (one writer has enumerated thirty-nine) indicative of the lithæmic state. Persons who have lived not wisely but too well, who have eaten and drunk largely, and persons who lead sedentary lives, may manifest it. Cases are seen in members of gouty families, who may never themselves have suffered from that disease. In such a family the daughters often escape, while one son may have lithæmic attacks of great severity, even though he may lead a temperate life and try in every way to avoid the conditions favoring the disorder. Cutaneous eruptions, such as eczema, are frequently associated with this diathesis; as are also disorders of the stomach and intestines, such as furred tongue, foul breath, and constipation. It may be accompanied by symptoms of a torpid liver. There may be a swelling of the parotid gland, simulating mumps.

Disorders of the circulatory system are frequently associated. The blood tension is persistently high, the walls of the blood-vessels become stiff, and heart and kidney changes gradually develop. Then dropsy may supervene. It is not unlikely that the lithæmic state may hasten the development of aneurism or apoplexy; for the nutritional disorder with which an excess of uric acid is associated induces in time increased tension in the blood-vessels, hardening of the arteries, chronic kidney disease, and changes in the muscular tissue of the heart.

Among nervous manifestations headache is frequent. Neuralgias, particularly sciatica, are not uncommon. There may be hot or itching feet at night. This symptom is as old as Plutarch, who observed it and called it 'the lisping of the gout.' Cramps in the legs and hot and itching eyeballs may be signs.

Chronic bronchitis is frequent in such cases, as are also certain affections of the eye, such as iritis, retinitis, and glaucoma.

The treatment is hygienic, dietetic, and medicinal. The lithæmic should live temperately, abstain from alcohol, and eat moderately. He should live in the open air, exercise vigorously, and keep regular hours. The skin should be kept active by cold baths with friction for the robust, and by warm evening baths for the debilitated. The dress should be warm, extremes of temperatures should be avoided, and care should be taken not to have the skin suddenly chilled. The appetite should be kept within reasonable bounds, meals should be at stated intervals, and food should be well chewed and eaten slowly. In the matter of food, quantity is a factor of more importance than quality. Each individual case should receive separate consideration from the physician. Nowhere, perhaps, is it more necessary than in lithæmia to consider the man as well as the ailment, and very often more the man than the ailment. This is especially so when we consider the possible sequelæ of this state. Among medicines, wine of colchicum, citrate of potash or of lithium, sodium salicylate, iodide of potash, guaiacum, quinine, piperazin, and the bitter tonics are employed. For external application, warm fomentations, ichthyol, and steaming are appropriate. Whenever the blood becomes increasingly alkaline, some of the accumulated acid is washed out of the spleen and the joints, and, before it is eliminated from the system, attacks the nerve-centres and the blood-vessels. The result is headache and depression of spirits. Acids relieve these symptoms, but cause further accumulation in the joints and spleen, with later serious results. (See GOUT; RHEUMATISM.) Consult: Haig, *Uric Acid as a Factor in the Causation of Disease* (Philadelphia, 1900); Miles, *Muscle, Brain and Diet* (London, 1900); Brunton, *Disorders of Assimilation, Digestion, etc.* (London, 1901).

LITHIUM (Neo-Lat., from Gk. λίθος, stone). A metallic chemical element, whose oxide was discovered in 1817 by Arfvedson. The metal itself was first obtained by Brande in 1822, and a quarter of a century later Bunsen and Matthiessen invented the process now used in making it (see below). Lithium is distributed in nature widely, but in very small quantities, the only minerals containing considerable amounts of it being the rare minerals spodumene, petante, and lepidolite. It is also found in certain mineral waters, and in the leaves of certain plants. Finally, it occurs in meteorites, and its presence has been detected in the sun. Lithium compounds being used in medicine, the sources of the element, especially lepidolite, are exploited on a considerable commercial scale. The mineral is first fused, so as to render it capable of being decomposed by strong hydrochloric acid; the latter is then caused to act on the mineral for several hours, nitric acid is added to the resulting solution, then the solution is diluted and neutralized with sodium carbonate, which precipitates out the iron, aluminum, magnesium, etc. On filtering, the liquid is evaporated to a small bulk and mixed with a strong solution of sodium carbonate, which now causes the precipitation of lithium carbonate. This carbonate may then be transformed into other lithium compounds, among which the chloride may be used to obtain metallic lithium, by means of a strong voltaic current passed through the fused salt.

The element lithium (symbol Li; atomic weight, 7.03) is the lightest metal known, its specific gravity being about 0.59. It is white, it can be pressed into wire, and it can be welded at ordinary temperatures. If exposed to the air, it soon becomes covered with a yellowish white film of oxide. Like sodium and potassium, with which it is classed as one of the 'alkali metals,' it decomposes water with great readiness. It is, on the other hand, less volatile than sodium or potassium, and does not distil at a red heat. Its melting-point is 180° C. (365° F.).

LITHIUM COMPOUNDS. Among these deserve mention the oxide, the carbonate, the citrate, and the salicylate. The *oxide*, Li_2O, may be prepared by heating the carbonate with charcoal; with water it forms the hydroxide, LiOH, which may, by crystallization from aqueous alcohol, be obtained as $LiOH + H_2O$; the hydroxide may also be prepared by the action of lime on lithium carbonate. The *carbonate* of lithium, Li_2CO_3, is a light, white powder sparingly soluble in water, but insoluble in alcohol. The citrate of lithium, $Li_3C_6H_5O_7$, is a white powder readily soluble in water; it may be prepared by the action of citric acid on lithium carbonate; 'effervescent lithium citrate' may be prepared by mixing sugar with citric acid, drying the mixture and adding to it sufficient quantities of sodium bicarbonate and lithium carbonate. The *salicylate* of lithium, $LiC_7H_5O_3$, is a white powder readily soluble in water and in alcohol; it may be prepared by heating lithium carbonate with salicylic acid and water, until effervescence ceases. A number of lithium salts are used in gout, in uric acid gravel, and calculus, owing to their capacity for causing sodium urate to dissolve in water. The carbonate, in the form of a lotion, is used to alleviate the pain of gouty inflammation and to heal gouty ulcers. The presence of lithium compounds in a given substance can be readily recognized by introducing a small amount of the substance into a colorless flame (like that of the Bunsen burner), to which they impart a characteristic red coloration.

LITHODOMUS, Lithophagus. See Mussel.

LITHOGENESIS. The branch of geologic science which deals with the origin of rocks. As to the nature of the rock masses which constituted the crust of the earth upon its primary cooling, little is known, nor is it certain that they are represented in any of the formations of the present day. From a study of the rock-forming processes now going on, and of the character of those masses that are exposed at the earth's surface, geologists have grouped all rocks upon a genetic basis, into three great classes or divisions. (1) The metamorphic rocks include those that have been profoundly changed from their original condition. The oldest rocks of which we have knowledge—the gneisses and crystalline schists—are members of this class; they are characterized by a banded or foliated structure, and may have originated from either sedimentary or igneous rocks by the effects of heat and pressure. (2) The igneous rocks comprise those which have cooled from a molten condition, such as lavas and granites. They have a massive structure and a glassy or crystalline texture. (3) The sedimentary rocks include those which have been derived from the igneous or metamorphic rocks by disintegration and decay, and which have been laid down on water or land. The water-deposited or aqueous rocks are the most important of this class; they are largely composed of fragmentary materials arranged into layers or strata, and hence are known also as sedimentary rocks. See Rocks.

LITHOGRAPHIC STONE (from Gk. λίθος, *lithos*, stone + γράφειν, *graphein*, to write). An even-grained, compact limestone, generally of a gray, drab, or yellowish color, that finds extensive use in lithography.

LITHOGRAPHY. Properly speaking, the art of writing, drawing, or engraving on stone of a particular kind, or on metals endowed with similar qualities; in a more general sense, the art of chemical or surface printing from stone or metal, by means of which drawings or writing traced with fatty ink are multiplied, in contradistinction to letter-press or relief, and copperplate or intaglio printing.

This art or process is based purely upon the principle of chemical affinity of fatty or resinous matter for substances of the same nature and their repugnance for water. The stone or metal used is, by reason of its porosity, capable of receiving and retaining water to the evaporating point, as well as fatty or resinous matter, to such an extent that to remove it mechanical means or powerful chemical agents are necessary.

Processes and Materials. When a drawing is made on stone or metal with either lithographic crayon or ink and all other parts of the surface are moistened with water, both the fatty substance and the moisture will penetrate the porous surface. A roller covered with fatty or resinous printing-ink passed over this stone or metal will cause the ink to adhere to the fatty or resinous parts constituting the design, and will be repelled by the moist parts; in consequence, the former only will appear in an impression.

The stone used in lithography is a variety of calcium carbonate of porous texture, known as 'lithographic stone.' The best variety is found at Solenhofen, Bavaria, and almost the entire industry receives its supply from that source. Stone of an inferior quality is quarried in England, France, Italy, Prussia, and Russia, and in later years in Canada and some of the Western States. Lithographic stone varies in color from a blue gray to a yellowish gray, the best quality being found among the light gray, and sometimes among the dark yellow varieties. The dark blue-gray or French stone is very fine in texture, but its color does not contrast sufficiently with that of the design to enable the artist or transferer to judge his work as well as on the light gray stone. It is sawn at the quarries into slabs from three to four inches in thickness, varying in size from 6 × 8 inches to 44 × 64 inches, and sold at prices ranging from 1½ cents to 30 cents per pound, according to size and quality. The larger sizes are extremely scarce when without flaws, such as open veins, streaks of glass, or soft lime spots.

It is partly due to this fact, and partly to the greater expense attached to the handling of stone, that almost since the invention of lithography a substitute has been sought for it. Zinc has been used during the last seventy years or more, in its natural state as well as, later on, with a coating embodying the components of the lithographic stone, under the name of 'calcsinter' plates. The use of zinc plates as a substitute for stone is, however, confined to the more ordinary grades of work, owing to the inferior and uncertain results obtained. About 1890 John Mullaly experimented with aluminum as a substitute for lithographic stone. His experiments were finally crowned with success, but it was some time before lithographers could be persuaded to make use of it. In the year 1894 Dr. Otto Strecker, of Mainz, Germany, invented a method now called the 'Strecker process.' for treating aluminum plates with a coating of aluminum salt. This method has come into very general use in Germany, and similar processes are now very considerably used in England, Germany, France, Russia, the United States, and other countries. Aluminum plates are said to have advantages over stone as to quality of work, and, apart from that, to offer all the advantages resulting from their uniform quality, their economy, flexibility, exemption from breaking, and ease of handling and storage. Designs can be removed from either stones or plates by chemical or mechanical means and their surfaces prepared for the reception of new designs about 200 times in the case of a stone four inches thick and of an aluminum plate 29-1000 of an inch thick. Lithographic crayon is composed of beeswax, shellac, tallow, mastic, turpentine, soap, and lampblack. Lithographic 'tusche' or ink, which is used for drawing with the pen, contains the same ingredients with the grease a trifle more predominant, in a liquid state.

When a drawing, which necessarily is made reversed, is completed on stone, its surface is bathed with a solution of acid and gum arabic. The object of this treatment, called 'etching,' is to prepare the surface of the stone having no design for the better retention of water; to clear the surface from any imperceptible fatty particles arising from contact with fingers, etc.; and, finally, to render the drawing insoluble in water, by decomposing the alkali contained in the soap which is one of the bases of its composition. After etching, the stone is thoroughly washed, first with water, then with turpentine, which removes every visible trace of the drawing, leaving only the fatty substance of the crayon or ink on the surface. After being repeatedly moistened and rolled in with printing-ink it is ready for printing.

Of the various processes employed in drawing on stone, the crayon process is without question the most important. For this purpose the stone is grained. This is done with sand and water between two slabs of stone, which are rubbed together with a circular motion until the lower one has the grain desired—either fine or coarse, according to the nature of the work to be performed. Next in importance is the pen-stipple process. For this purpose the stone is polished with pumice. Stippling consists of drawing with small dots, the values in shading being obtained by the relative density of these dots.

A mode of procedure which differs widely from both crayon and pen-stipple manner is engraving, though based on the same principle. In this case the stone is finely polished and etched and then covered with a dark ground—lampblack and gum arabic dissolved in water. The drawing or writing is scraped into the ground with an engraving-needle or a scraper, laying bare the surface of the stone. When the design is finished, the stone is covered with linseed oil, the ground washed off, the surface moistened, and printing-ink is applied by means of a dauber, which then adheres only to the lines of the design, by reason of the oil they contain.

Chromolithography. In this either the crayon process, the pen-stipple, or a combination of both, is employed. The important feature of this branch of lithography is to obtain a perfect register of the colors to be superposed. To accomplish this, for higher class color work, a key is made by tracing with an engraving-needle on gelatin a complete outline of the original, following even the most minute patches of color. The lines thus engraved on gelatin are filled in with lithographic ink and transmitted to stone by pressure in a hand-press. Register marks of thin crossed lines are then added in the margin of top, bottom, and sides, which become the guides for accurate register in printing. The design is then 'etched' and rolled up with printing-ink and impressions to the number of colors required are made therefrom. These so-called 'offset' or 'key' impressions are in turn transmitted to stone by pressure, having first been powdered with a finely ground dry color, which, owing to its fatty qualities, adheres only to the line work. Where a drawing-stone is used in place of the key, offset impressions of the same, supplied with the register-marks, accomplish the same purpose. The number of colors used varies according to the quality of the work desired. For commercial purposes the number ranges from three to fifteen, and in some cases, where especial results are desired, as many as twenty and thirty colors are used. For monochromes four tints are usually employed: one for the main drawing, a light ground tint, a medium tint for modeling, and finally a dark tint for accents.

Photolithography. In later years photography has been made a valuable adjunct to lithography. One of its applications is photolithography, by means of which pen drawings are faithfully reproduced at comparatively small expense. Another result is the application of the half-tone or Meisenbach process to lithography, for monochromes, and chromolithographs, in which case a photographic reproduction from the original on stone forms the basis for the several color plates, taking the place of the key, subject to the manipulation of the expert chromolithographer.

Of the several methods in use to achieve a photographic reproduction on stone, the oldest one, invented by Niepce in 1833, is based on the property of asphaltum dissolved in oil of lavender to become insoluble when exposed to actinic action. Thus when a half-tone negative is superimposed upon a stone coated with an asphalt solution, in perfect contact, and exposed to the sun's rays, the asphalt solution will only be affected by such light as can pass through the negative. Dissolving the parts not affected in this manner, by means of turpentine, will produce a positive on stone, which, having in its composition the necessary ingredient, grease, is prepared for printing purposes in very much the same manner as drawing on stone.

The method most generally employed, however, is the albumen process. Albumen in solution with bichromate of potassium has the same properties as the asphaltum solution. It is more sensitive to the chemical action of light, achieving the results desired in a much shorter space of time. After exposure the stone is immediately covered with printing-ink to prevent further action. The parts that remain soluble are washed away with water, the ink adhering only to the parts that have become insoluble, thus creating the conditions essential for lithographic purposes.

The three-color process is also applied to some extent in lithography, reproducing on stone the three negatives necessary for this process by either of the methods described. Another photolithographic process, which, though still in its experimental stage, deserves mention, is the grain process. The object in view is to substitute for the geometrical pattern characteristic of half-tone work, a somewhat irregular grain finish which more closely resembles the results of a crayon drawing on stone. Some very fair results have been achieved in this direction.

Transfer Process. The rapid development of the lithographic industry led to the universal adoption of the transfer process, by which the same design can be reproduced as many times at one impression as the size of the sheet to be printed will admit. Impressions from the original stone are made with transfer ink (containing practically the same ingredients as lithographic ink) on paper coated with a sizing of starch and glycerin. The impressions are then laid in their proper position on a sheet of paper and fixed by indentations made with the dulled point of an engraving-needle. This sheet is then laid down on a clean polished stone or metal plate and repeatedly pulled through a hand-press until all the ink has been transferred from the impressions to the stone or metal plate, the paper being frequently moistened during this process until it can readily be removed. A weak solution of gum and water is applied, the stone is then rolled up with printing-ink, and the transfer is finally 'etched' in the same manner as an original drawing to make it ready for printing. In chromolithography the first transfer made is that of the key-plate containing the register marks. An impression from this transfer, coated with shellac to insure against stretching or shrinking, is mounted on a sheet of zinc or aluminum and the impressions of all succeeding transfers are 'stuck up' or indented on this key-sheet, so that all the colors will be in accurate register with each other.

LITHOGRAPHIC PRINTING. Machinery used for lithographic printing may be divided into two classes: hand presses and power presses. The construction of the lithographic power press varies but slightly from that of the typographic power press. It is operated on the same general principle, except that it has in place of the letter-press form a lithographic stone in its bed, and is supplied with mechanism for applying the moisture to the stone. When the hand press is used the moistening is done by means of a sponge.

The hand press consists of (1) a movable bed for the stone, resting and traveling on rollers; (2) an impression bar or scraper of boxwood, with a wedge-formed edge, running lengthwise, covered with leather and fitted to a yoke; and (3) a tympan hinged to that end of the bed nearest the impression-bar. After the stone has been moistened and rolled up with ink, the paper upon which the impression is to be made is laid upon the stone in the desired position and a backing sheet placed over it; the tympan is lowered to cover the entire stone and bed, the edge of which is then brought forward under the impression-bar; the pressure is applied by means of a hand lever at the side of the press and the entire length of the bed passed under the impression-bar. The pressure is then released and the bed brought back to its original position, the tympan raised, and the sheet, having taken the impression, is taken off. This method of hand printing, which before the introduction of the power press was used exclusively for lithographic printing, is now only used for the purpose of making artist-proofs and transfers for printing on power presses.

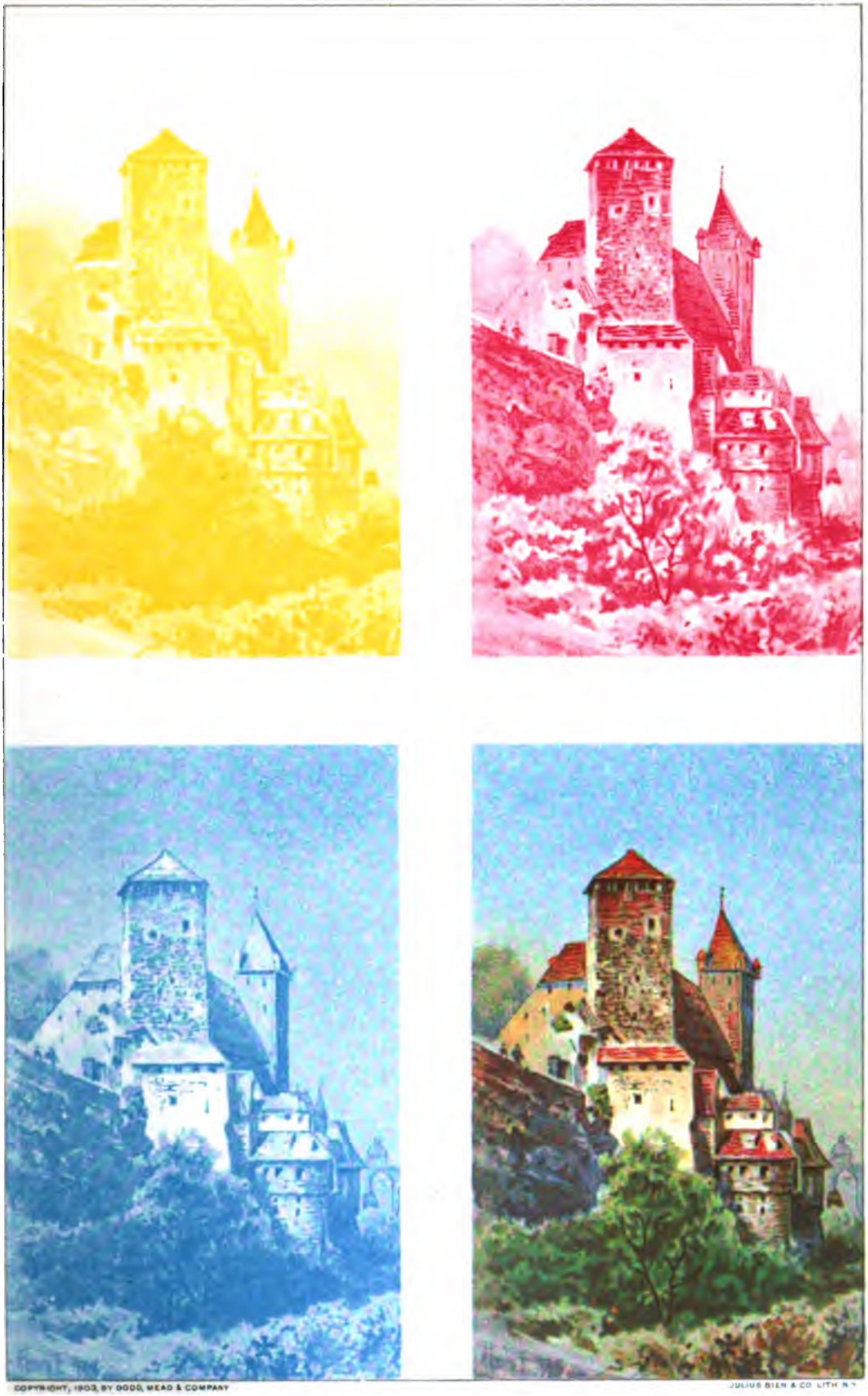
The substitution of the flexible aluminum plate for lithographic stone has resulted in the successful use of rotary printing machinery, and has opened the field of multi-color printing by the lithographic process. For this purpose rotary presses are used which print two or more colors in rapid succession before delivering the sheet. The rotary lithographic press consists of two cylinders—one to hold the plate and the other to furnish the pressure. It is supplied with a mechanism similar to that of the flat-bed lithographic press, for distribution and application of moisture and ink. Its speed is about 50 per cent. greater than that of the stone or flat-bed press. Rotary presses having two plate-cylinders and printing two colors each time a sheet is fed are already largely in use, and three-color and four-color presses are now being built on the same general principle.

HISTORY.

Lithography was invented in 1798 by Aloys Senefelder (q.v.), a printer of music from copper plates at Munich. Experiments made while thus engaged led to his discovery of chemical or surface printing. It has been claimed by some that Simon Schmidt, who printed from stone as early as 1788, deserves credit for the invention of lithography, but as a matter of fact Schmidt merely substituted stone for metal in relief printing, which has nothing in common with lithography. In 1806 Senefelder established himself at Munich as a lithographic printer. Munich thus became the centre of the art; in 1809 there were no less than seven separate establishments, together with a number of private presses. Conspicuous among the first lithographers of Munich was Ferdinand Piloty, father of Karl Piloty, who in 1808 published together with Strixner a series of copies of old masters, and in 1815 reproductions of the pictures in the Munich Gallery. The inventor died in 1834, since which time there have been few improvements upon his methods, so thoroughly did he cover the field. From Munich the art rapidly spread throughout Europe. After several unsuccessful attempts it was established in Paris by Godfrey Engelmann, a native of Mülhausen (Alsace), in 1816. To him is due the credit of inventing chromolithography, for which the French Government granted him letters patent in 1837. In 1816 Franz Hanfstängl visited Munich, and in 1834 he founded the first lithographic house in Berlin. Lemercier had meanwhile established himself in Paris, and made great progress in the new art. Hanfstängl visited him in 1835 to study his methods, and on his return to Berlin greatly improved the art. Of especial importance was the lithograph series designed by Adolf Menzel (q.v.). The first lithographic house in London was established in 1822 by Hullmandel, a pupil of Engelmann of Paris, although a previous attempt had been made by Senefelder himself, in partnership with André, of Offenbach. In America lithography was introduced as early as 1828 by Barnett & Doolittle, in New York City. It remained for Paris, however, to develop lithography as a high art. The climax was reached during the reign of Louis Philippe, by such men as Daumier, Grandville, Travies, and Gavarni, famed for their satirical drawings; Deveria, Delacroix, Johannot, and Gigoux, the delineators of romantic literature; Charlet and Raffet, who glorified on stone the conquests of Napoleon; Géricault and Richard Park Bonington. James Duffield Harding and Alexandre Calame produced some noted landscapes, Eugène Isabey lithographed some very fine marines, and Julien's fame as a lithographic artist culminated in his famous "Etudes en Deux Crayons." With the introduction of the power press, lithography soon developed into a world-wide industry. Its applications and accomplishments multiplied to such an extent, not only artistically, but commercially, that to enumerate them would be impossible.

Consult: Aloys Senefelder, *Vollständiges Lehrbuch der Steindruckerei* (Munich, 1818; English translation, London, 1819); Engelmann, *Traité théorique et pratique de lithographie* (Paris,

THREE COLOR PROCESS



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1839); Bergman, *Das Ganze des Steindrucks, nebst Anhang von der Zinkographie* (Weimar, 1843); Weishaupt, *Theoretisch-praktische Anleitung zur Chromolithographie* (Quedlinburg and Leipzig, 1847); *Das Gesammtgebiet des Steindrucks, nebst Anhang von der Zinkographie* (Weimar, 1865); Bregeant, *Nouveau manuel complet de l'imprimeur-lithographie* (Paris, 1850); Richmond, *Grammar of Lithography* (London, 1885).

LITHOL'OGY. See PETROLOGY.

LITHOMANCY. See SUPERSTITION.

LITH'OMARGE (from Gk. λίθος, *lithos*, stone + Lat. *marga*, marl). A name given to the compact earthy varieties of halloysite, kaolinite, and pinite. They are essentially hydrated aluminum silicates, also containing iron oxide and other coloring substances, and are either white, light yellow, or red in color, according to the amount of impurity. These minerals are soft, greasy to the touch, and adhere strongly to the tongue. They are found in Germany, Russia, Cornwall, England, and at various localities in the United States.

LITH'ONTRIP'TICS (from Gk. λίθον, *lithon*, acc. sg. of λίθος, *lithos*, stone + τρίβειν, *tribein*, to rub, to wear out). An old term applied to remedies which, whether taken by the mouth or injected into the bladder, act as solvents for urinary calculus or stone.

Various medicines have at different times been recommended and employed. Rather more than a century ago, lime-water and soap, when swallowed in sufficient quantities, had a high reputation as solvents for urinary calculi. These were the only active ingredients in Miss Stephens's *Receipt for the Stone and Gravel*, which was reported on so favorably by a committee of professional men that the English Parliament, in 1739, purchased the secret for £5000. The treatment doubtless afforded relief; but there is no evidence that any calculus was actually dissolved, for in the bladder of each of the four persons whose cure was certified in the report the stone was found after death. At present no substance is known which, taken by the mouth, has the power of dissolving calculi. The relief which, in many instances, has followed the administration by the mouth of substances supposed to be lithontriptics has been derived not from the solution of the calculi, but from the diminution of pain and irritation in the bladder.

LITHOPHYTE (from Gk. λίθος, *lithos*, stone + φυτόν, *phyton*, plant). A plant that grows on rocks, sometimes underneath the water, as marine algæ. See BENTHOS; ROCK-PLANTS.

LITHOSPHERE. See CRUST OF THE EARTH.

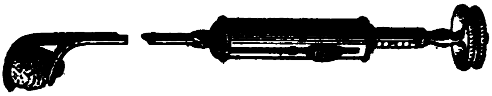
LITH'OSTRO'TION (Neo-Lat., from Lat. *lithostrotus*, mosaic, from Gk. λιθόστρωτος, paved with stone, from λίθος, *lithos*, stone + στρωτός, *strōtos*, covered, from στρωννύναι, *strōnnynai*, to spread). A characteristic fossil coral of the Carboniferous limestones, found in all parts of the world where those rocks are known. This coral, allied to Cyathophyllum, forms a rounded mass of more or less closely packed cylindrical or polygonal tubes, the upper ends of which have cells with numerous strong radiating septa and usually also a prominent central conical elevation or columella. About fifteen species are known, of which the more common are Lithostrotion Canadense, of the Mississippi Valley States, and Lithostrotion junceum, of Europe and Asia. See CORAL.

LITHOT'OMY (Lat. *lithotomia*, from Gk. λιθοτομία, lithotomy, from λίθος, *lithos*, stone + τομή, *tomē*, a cutting, from τέμνειν, *temnein*, to cut). The technical name for the surgical operation popularly called *cutting for stone.*

As most of the symptoms of stone in the bladder (see CALCULUS) may be simulated by other diseases of the bladder and adjacent parts, it is necessary to have additional evidence regarding the true nature of the case before resorting to so serious an operation as lithotomy. This evidence is afforded by *sounding* the patient—a simple preliminary operation, which consists in introducing into the bladder, through the natural urinary passage (the urethra), a metallic instrument, by means of which the stone can be plainly felt and heard. From the shortness of the female urethra and the extent to which it can be dilated, and, additionally, from the comparative rarity of calculous affections in women, the operation of lithotomy is almost exclusively restricted to the male sex.

Lithotomy has been performed in various ways at different times. The earliest form of lithotomy is known as *cutting on the gripe*, or *Celsus's method.* It received the former name from the stone, after being fixed by the pressure of the fingers in the anus, being directly cut upon and extracted; and the latter, from its having been first described, so far as is now known, by Celsus, although it had probably been practiced from time immemorial. At a later period this operation received from Marianus the name of the *apparatus minor* (from a knife and hook being the only instruments used), to distinguish it from his own method, which he called the *apparatus major*, from the numerous instruments he employed. The *Marian method* was founded on the erroneous idea that wounds of membranous parts would not heal, while their dilatation was comparatively harmless. The object was to do as little as possible with the knife, and as much as possible with dilating instruments; and the necessary result was laceration and such other severe injury that this became one of the most fatal operations in surgery. Nevertheless, it was the operation mainly in vogue for nearly 200 years. At present, surgeons, operating by cutting through the perineum (the body between the rectum and the bladder), use a median, or a lateral, or a slightly curved transverse incision, according to individual preference. But either of these methods is suitable only for the removal of a small stone; therefore it is most frequently advisable to remove the calculus by an abdominal incision (suprapubic lithotomy), which was first employed by Franco in 1561. By this method the opening is made first above the pubes, and the bladder is entered without cutting the peritoneum. For details of the operation and of after-treatment, consult Dennis and Billings, *A System of Surgery* (Philadelphia, 1895).

LITHOT'RITY (from Gk. λίθος, *lithos*, stone + Lat. *tritus*, p.p. of *terere*, to rub, to grind). The surgical operation of breaking up a stone in the bladder into such small fragments that they may readily be expelled through the urethra. Although the importance of such an operation has been recognized from the earliest time, a French surgeon, Civale, who commenced his researches in 1817, but did not perform his first operation till the beginning of 1824, is entitled to be regarded as the discoverer of lithotrity. The instrument by which the disintegration of the stone is effected is introduced in the same manner as a catheter or sound into the bladder, and, after catching the stone, crushes it to pieces, the stone being grasped by the blades of the instrument, one blade acting on the other by means of a screw. The small fragments are then washed out of the bladder by means of a special apparatus, called by Bigelow an evacuator. Great care must be taken that no fragment remains in the bladder, as it would surely form the nucleus of a new stone.



LITHOTRITE.

The process seems, at first sight, so safe, as compared with the operation of lithotomy, that it is necessary to distinguish those cases in which it may be resorted to and those in which it is contra-indicated. It may be resorted to when the patient is an adult, and the urethra full-sized and healthy, so as freely to admit the passage of the instrument; it must be avoided in children, in consequence of the smallness of the urethra, and also when there is great irritation and thickening of the bladder; when there is great enlargement of the prostate, which hinders the manipulation of the instrument and the escape of the broken fragments of stone; when the stone is of large size, as, for example, of a greater diameter than two inches; and when there is reason to believe that the concretion is a mulberry calculus, which, from its extreme hardness, cannot readily be broken.

LITHOLAPAXY is the term used to denote an operation by which the fragments of the stone are removed at the same time the stone is crushed. This procedure was made possible by the perfection of the instruments by Bigelow of Boston, Mass., in 1878, Otis, of New York, having taught that instruments of large size can be introduced safely into the bladder. Consult Gould and Pyle, *Cyclopedia of Medicine and Surgery* (Philadelphia, 1900).

LITHUANIA, lĭth'ū-ā'nĭ-ȧ (Lith. *Letuva*). A region in Western Europe, which in the Middle Ages constituted an independent realm, and whose history is closely connected with that of Poland, in whose dismemberment it passed to Russia. (See LITHUANIANS and LITHUANIAN LANGUAGE AND LITERATURE.) Lithuania had different boundaries at different periods. At the time of the partition of the Polish monarchy, at the close of the eighteenth century, it extended from Courland and Livonia on the north to Volhynia and the Ukraine on the south, and from Poland and East Prussia on the west to beyond the Dnieper on the east. The region included within these limits, with an area of about 100,000 square miles, is embraced in the governments of Kovno, Vilna, Grodno, Vitebsk, Minsk, Mohilev, and Suwalki (the last in Russian Poland). The country comprised: Samogetia (Kovno) in the northwest; Lithuania proper (the palatinates of Vilna and Troki) in the west; White Russia in the east; Black Russia in the southeast; and Polessie in the south. This region was formerly, and is still in great part, covered with forests and marshes, and the soil is very unproductive. The Imperial Forest of Bialowicza, comprising a reservation of 350 square miles, is the most famous. The chief rivers are the Dnieper, Pripet, Beresina, Düna, Niemen, and Bug. The inhabitants are Lithuanians, Russians, Poles, and Jews. The early history of Lithuania is very obscure. Having no natural boundaries, it was anciently subject to constant invasions by its neighbors. But as the Lithuanians had no fortified towns to be captured, and as the woods and marshes were almost impassable, the country remained practically independent. The people were little advanced in civilization and had no central government until the latter part of the Middle Ages. They clung tenaciously to their pagan beliefs and practices, and it was only about the beginning of the fifteenth century that Christianity was established, the nation accepting the Roman Catholic faith. Early in the thirteenth century one of the chiefs, named Ryngold, whose personality is bound up with legend, is represented as having instituted a stable government; the first clearly historic character, however, is Ryngold's son, Mindove, who reigned over Lithuania till about 1263. At this time the Teutonic Knights were establishing their power in the Baltic regions, spreading Christianity with fire and sword, and the bloody wars waged with them are a prominent feature in the early history of the Lithuanian principality. Fierce wars were also carried on against the Russians. Gedimin (about 1315-40) wrested vast territories from Russia, including Volhynia and Kiev. In 1386 Jagello, Grand Prince of Lithuania, married Hedvig, daughter of Louis the Great of Poland, and mounted the Polish throne, having been previously baptized. For a hundred years from the time of Jagello Lithuania and Poland had separate rulers, a loose political union existing between the two countries. From 1501 they had a common sovereign, and in 1569 the Diet of Lublin decreed the permanent union of Poland and Lithuania into one commonwealth, to be governed by an elective king. Henceforth the history of Lithuania is that of Poland. (See JAGELLONS; POLAND; RUSSIA.) Consult Schiemann, *Russland, Polen und Livland bis ins 17te Jahrhundert* (2 vols., Berlin, 1886-87).

LITHUANIAN LANGUAGE AND LITERATURE. The language and literature of about 2,000,000 Lithuanians, the great bulk of whom live in the Russian governments of Kovno, Vilna, Grodno, and Suwalki (the last in Poland). There are about 100,000 in the Prussian Province of East Prussia, and a number have emigrated to the United States. With the Lettic (q.v.) and Old Prussian (q.v.) the Lithuanian constitutes the Baltic subdivision of the Balto-Slavic group of the Indo-Germanic family of languages. The earliest Slavic literary records antedate the oldest Lithuanian records by seven centuries, yet the Lithuanian is more archaic than the Slavic in phonology, although in morphological structure it is less primitive. It has long, short, and half-long vowels, of which the Slavic, excepting the Servian and Czech, has no relics. The Lithuanian employs three accents: for short vowels—the grave; for long vowels either the acute to mark a 'falling' tone, e.g. *kó-tas*, 'steel,' or the circumflex to mark a compound 'rising-falling' tone, e.g. *rā-tas*, 'wheel.' Like Sanskrit and Slavic, the Lithuanian accent is entirely free, often receding to the fifth syllable from the ėnd, shifting from the root upon the affix and vice versa, e.g. *sukù*, 'I turn,' *súka*, 'he turns,' Skt. *dvēṣmi*, 'I hate,' *dviṣmás*, 'we hate,' *á-dvēṣam*, 'I hated;' Lith. *rankà*, 'hand,' gen. sing. *rañkos*.

Among the most notable phonological characteristics of the Lithuanian language are the retention of diphthongs—*véidas*, 'face, view,' Gk. *ϝεῖδος*, Slav. *vidŭ;* Lith. *baisùs*, demon, Slav. *bēsŭ;* the retention of the primitive endings of nouns: Lith. *vìlkas*, 'wolf,' Skt. *vṛkás*, Slav. *vlŭkŭ;* the complete loss of *h*, and the change of the aspirates to tenues: the German words *Christus*, *Franzose*, are *Kristùs*, *Prancūzas* in Lithuanian. As in Slavic and Indo-Iranian, Indo-Germanic k̑ became a sibilant: Indo-Ger. **Kmtó-m*, hundred, Lith. *Szim̃tas*, Skt. *śatám*, Av. *sat'm*, Slav. *sŭto*, Gk. *ἑκατόν*, Lat. *centum*.

In morphology, the Lithuanian has generally preserved the terminations remarkably intact. It has seven of the eight Indo-Germanic cases, and the three numbers; the neuter gender appears in pronouns only. There is no trace of the article, though, as in Old-Church Slavic and Russian, the postpositive use of *ja* changes an adjective from the indefinite to the definite form. The verb makes the third singular do duty for the third persons of all three numbers; it possesses four tenses: present, preterite, future (formed by the addition of *-siu*, Indo-Ger. *oso*, Skt. *-sya*, Gk. *σ*, e.g. Lith. *δύσιυ*, Skt. *dāsyāmi*, Gk. *δώσω*, I shall give), and imperfect; there are distinct forms for the indicative, optative, imperative, infinitive, and participle. The passive is periphrastic throughout, but the active construction is substituted whenever possible. A reflexive voice also is formed by the addition of *-s* (earlier *-si*, reflexive pronoun) to the active forms.

In its vocabulary the Lithuanian has drawn to a considerable extent from the German, Russian, and Polish. Its numerous dialects fall into two groups: the High (Southern) Lithuanian, which changes the combinations *tj* and *dj* to *cz*, *dz*, and the Northern (Low) Lithuanian, which retains *tj* and *dj*.

The earliest literary remains in Lithuanian are a translation of Luther's smaller Catechism (Königsberg, 1547); a baptismal formulary (dating from 1569); another translation of Luther's Catechism and the Gospels (1579), and the prayer-books and translation of the Bible by the Preacher Jan Bretkun (1535-1602). By 1701 fifty-nine books had been printed in Lithuanian, but most of them were destroyed by unknown hands. To the Calvinist propaganda the Lithuanian owes its development for literary purposes, and the publication of a Calvinist New Testament (1701) marks the new period, when works of other than liturgical purport began to appear. The most important name during this period is that of the poet Christian Donalitius (1714-80). His pastoral epic, *The Four Seasons*, in hexameters, displays uncommon powers of observation and a facile style, though as poetry it is second rate. This poem and six extant fables were published by Schleicher (Saint Petersburg, 1865) and Nesselmann (Königsberg, 1869), with translation, notes, and glossary. Another important work was Ruhig's *Lithuanian Dictionary* (1749), later reëdited by Milke, with a preface by the philosopher Kant. The publications until the last quarter of the nineteenth century were mainly religious, although between 1801 and 1891 some 1200 different books were printed. In 1861 Olechnowicz published fables and stories from Lithuanian life, and later the Bishop Baranoski wrote an epic, the *Onikshta Grove*. Fritz Kelch (1801-77) issued the first Prussian-Lithuanian newspaper, and in 1883 *Aussra* (*Dawn*), the first magazine, the organ of the Young Lithuanian Party, was founded by Basanowicz. Between 1834 and 1895 no less than thirty-four periodicals appeared in the United States. Consult: Schleiker, *Handbuch der litauischen Sprache* (Prague, 1856-57); Kurschat, *Grammatik der litauischen Sprache* (Halle, 1876); Voelkel, *Litauisches Elementarbuch* (Heidelberg, 1879); Wiedemann, *Handbuch der litauischen Sprache* (Strassburg, 1897); Nesselmann, *Wörterbuch der litauischen Sprache* (Königsberg, 1851); Kurschat, *Wörterbuch der litauischen Sprache* (Halle, 1870-83); Bezzenberger, *Litauische und lettische Drucke des sechzehnten* (*und siebzehnten*) *Jahrhunderts* (Göttingen, 1874-84); id., *Beiträge zur Geschichte der litauischen Sprache* (ib., 1877); id., *Litauische Forschungen* (ib., 1882); Wiedemann, *Das litauische Præteritum* (Strassburg, 1891); Nesselmann, *Litauische Volkslieder* (Berlin, 1853); Juszkiewicz, *Lietuviškos dainos* (Kazan, 1880-82); id., *Lietuviškos svotbines dainos* (Saint Petersburg, 1883); Bartsch, *Dainu Balsai* (Heidelberg, 1886-89); Schleicher, *Litauische Märchen, Sprichworte, Rätsel und Lieder* (Weimar, 1857); Leskien and Brugmann, *Litauische Volkslieder und Märchen* (Strassburg, 1882).

LITHUANIANS. A branch of the Letto-Lithuanian group of the Aryan family, living mainly in European Russia, between the White Russians and the Baltic; height, 1.643 meters in Lithuania, and 1.639 meters in Poland. They are well made, blond, and with oval face, long, thin nose, thin lips, blue eyes, white skin, and light hair. They are said to exhibit elements of sub-Northern and Eastern race. They are largely husbandmen, wagoners, and woodmen.

LITHUANIAN VERSION. See BIBLE.

LITITZ, lĭt′ĭts. A borough in Lancaster County, Pa., eight miles north of Lancaster; on the Reading and Columbia Railroad (Map: Pennsylvania, E 3). It is a popular summer resort, its attractions including the famous Lititz Springs, and has Linden Hall Seminary, established by the Moravians in 1794. Among the industrial establishments are cigar-factories, knitting-mills, chocolate and cocoa works, and a corn-starch factory. Population, in 1890, 1494; in 1900, 1637. Lititz, founded by Moravians (q.v.) in 1757, was named after a village in Bohemia whence some of the forefathers of the *Unitas Fratrum* had emigrated, and was organized from Warwick township. The Brothers' House, built in 1759, was used as a hospital during part of the Revolutionary War, and a number of soldiers died and were buried here. Consult: *Moravian Historical Society Transactions*, vol. ii. (Bethlehem, Pa.), and Mombert, *An Authentic History of Lancaster County, Pa.* (Lancaster, 1869).

LITMUS (corruption of *lacmus*, from *lac*, from Pers. *lak*, lac, from Skt. *lākṣā*, lac-insect, from *lakṣa*, hundred thousand; so called from the great numbers of the insect in a single nest). A coloring matter of vegetable origin, indispensable in chemical laboratory work. It permits the chemist readily to ascertain whether a substance submitted to him for examination is acid or alkaline, and is therefore employed in every step of analytic determinations. Acids turn blue litmus red; alkaline solutions, on the contrary, turn red litmus blue. In laboratories litmus is used either in the form of a solution, or in the form of test-paper impregnated with it. Litmus is manufactured principally in Holland, from *Lecanora tartarea* and other lichens. The process employed is similar to that used in the manufacture of archil (q.v.); the lichens are ground into a pulp with water, and potassium carbonate and ammonia are added. Under the action of these substances and of atmospheric air, the mass gradually assumes a blue color, owing to the formation of the coloring principles of litmus. Chalk or gypsum is then added, to render the mass thick enough to be formed into rectangular cakes, which are dried and brought into the market. The chemistry of litmus is but little known; the following, however, have been shown to be its chief coloring principles, viz. azolitmin, whose brownish-red color is turned blue by ammonia; purplish-red erythrolein, which, by the action of alkalies, is turned purple; and erythrolitmin, whose red color is changed by alkalies to blue. These coloring substances exist in commercial litmus in the form of lakes, i.e. combined with metallic hydroxides.

LIT′OLFF, Henry (1818-91). A European pianist and composer. He was born in London, studied the piano under Moscheles for several years, and in 1832 made his professional début in London. He went to France and then wandered around Europe giving concerts until 1851, when he settled in Brunswick and married the widow of the music publisher Meyer, of whose business he took charge. In 1860 he transferred the business to his adopted son Theodor, who in the following year started the cheap edition of classical music, called 'Collection Litolff.' As a pianist Litolff was brilliant, passionate, but uneven. His compositions were melodious and his piano pieces (for example "Spinnlied") were popular. Of his other works the most noteworthy are: The symphony concertos Nos. 3, 4, and 5; the oratorio *Ruth et Boaz* (1869); a funeral march for Meyerbeer; the operas *Die Braut vom Kynast* (1847) and *Les Templiers* (1886); and the operetta *Héloïse et Abélard.* He died in Paris.

LIT′TA, Pompeo, Count (1781-1852). An Italian historian. In 1804 he entered the French army, and participated in the campaigns in Germany. In the Italian revolutionary epoch of 1848 he was for a short time Secretary of War for the Provisional Government of Milan. His fame, however, rests on the authorship of a superb work on the celebrated families of Italy, *Famiglie celebri d'Italia* (1819-38), which is commended equally for the fullness and accuracy of its biographies and the elegance of its style. At the time of his death it embraced fifty-three histories, to which others have since been added by various writers, including Odorici and Passerini.

LIT′TELL, Eliakim (1797-1870). An American editor and publisher, born in Burlington, N. J. He began in 1819 to edit and publish in Philadelphia the *National Recorder*, which, changed in 1821 to the *Saturday Magazine*, first published in America De Quincey's *Confessions of an English Opium-Eater.* In 1822 he established the *Museum of Foreign Literature, Science, and Art,* and in 1844 founded in Boston *Littell's Living Age.*

LIT′TLE, Charles Coffin (1799-1869). An American publisher, born at Kennebunk, Me. In 1837 he founded the firm of Charles C. Little & Co., later Little, Brown & Co.

LITTLE, Thomas. The nom-de-plume of Thomas Moore.

LITTLE, William John Knox. See Knox-Little.

LITTLE BEAR. The constellation Ursa Minor.

LITTLEBOROUGH, lĭt′t'l-bŭr-ō. A manufacturing town of Lancashire, England, 3 miles northeast of Rochdale (Map: England, D 3). Population, in 1891, 11,000; in 1901, 11,160.

LITTLE BRITAIN. A small neighborhood in the centre of London, during the time of the Stuarts a famous quarter for booksellers. Its name was derived from the former residence there of the dukes of Brittany.

LITTLE CHIEF HARE. A book name, derived from the Indians, for the pika of the Rocky Mountains. See Pika.

LITTLE COLORADO. One of the principal tributaries of the Colorado River. It rises in western New Mexico and flows northwestward through Arizona in an arid valley, parts of which have been irrigated by the Zuñi Indians. In the dry season it is sometimes reduced to a string of ponds. Near its mouth it plunges into a deep cañon which runs into the Grand Cañon of the Colorado near its deepest point. The length of the Little Colorado is about 225 miles.

LITTLE CORPORAL. An affectionate nickname given to Napoleon after the battle of Lodi on account of his youthfulness and small size.

LITTLE CROW (?-1863). A Sioux Indian chief. In 1851 the Sioux or Dakota Indians ceded most of their lands in the present State of Minnesota to the National Government and removed farther north to lands which proved unsatisfactory. Though Little Crow had been influential in bringing about the transfer, he took advantage of every opportunity to create dissatisfaction. Some young men of the tribe murdered some settlers in 1862, and Little Crow urged a general massacre, claiming that the South would win in the Civil War then being waged, and that the Government could not punish them. On August 18, 1862, the whites at two agencies were massacred and it is estimated that a thousand settlers were killed. Ex-Governor Sibley was appointed to the command of a military expedition and completely defeated the Indians at Wood Lake. Two thousand Indians and many whites held as prisoners were taken and 303 Sioux were condemned to death by a military court, but President Lincoln intervened, and only 38 were executed. Little Crow fled, but was shot by a settler the next year. Much information on this raid may be found in *Collections of the Minnesota Historical Society,* vol. vii. (Saint Paul, 1887-94).

LIT′TLEDALE, Richard Frederick (1833-90). A controversial Anglican writer. He was born in Dublin; was graduated at Trinity College, Dublin, 1854; was ordained in the Church of England, 1856; after a few years of parochial service in London, where he interested himself in charities, he resigned his charge in 1862 and devoted himself to authorship, making a special study of liturgies and of the relations between the national Church and dissenting bodies. He was author of many works, including *Catholic Ritual in the Church of England, Scriptural, Reasonable, and Lawful* (1865); *Church Reform* (1870); *Plain Reasons Against Joining the Church of Rome* (1880). He also contributed much to the periodicals, and was editor of the *Church Times.*

LITTLE DORRIT. A novel by Charles Dickens, which appeared serially from 1855 to 1857, and the nickname of its heroine, Amy Dorrit. The scene is laid in the Marshalsea Prison, where Amy's father, William Dorrit, is confined for debt so long that he gains the title of 'Father of the Marshalsea.' When he is finally set free, his daughter marries Arthur Clennam in the prison.

LITTLE-ENDIANS. See BIG-ENDIANS.

LITTLE ENGLAND. A name given to Barbados.

LITTLE FALLS. A city and the county-seat of Morrison County, Minn., 96 miles northwest of Minneapolis, on the Mississippi River, and on the Northern Pacific Railroad (Map: Minnesota, D 5). It has a city library, and a fine hospital and court-house. Little Falls is the commercial centre for a productive agricultural and lumbering district, and manufactures lumber, paper, flour, beer, agricultural implements, and bricks. The dam across the river here furnishes extensive water-power. First settled in 1849, Little Falls was incorporated in 1889. The government, under a charter of 1902, is vested in an annually elected mayor and a municipal council. Population, in 1890, 2354; in 1900, 5774.

LITTLE FALLS. A city in Herkimer County, N. Y., 21 miles east by south of Utica, on the Mohawk River, the Erie Canal, and the New York Central and Hudson River and the West Shore railroads (Map: New York, F 2). It has a picturesque location on the slope of a narrow and rocky defile, flowing through which the river falls 45 feet in less than a mile, forming a number of cascades—the origin of the city's name. Good water-power has contributed to the development of the city as a manufacturing centre; its products include bicycles, knit goods, knitting machinery, paper, leather, furnaces, carriages, etc. The city has a public school library of 5000 volumes and a city hospital. There are municipal water-works. A small settlement here was destroyed by the Indians and Tories in June, 1782, and the place was not resettled until 1790. Little Falls was incorporated as a village in 1811, reincorporated in 1827, and in 1895 was chartered as a city. On the outskirts is the grave of General Herkimer, of Revolutionary fame, with a monument erected in 1896. Population, in 1890, 8783; in 1900, 10,381.

LITTLE GENTLEMAN IN VELVET. The name under which, in the reign of Queen Anne, toasts were frequently drunk by the Jacobites to the mole which was the ultimate cause of the death of William III. The King's horse stumbled against a mole-hill, throwing his rider, whose injuries brought on the illness of which he died in 1702.

LITTLE GIANT. A nickname applied to Stephen A. Douglas, referring to his great intellect combined with small size.

LITTLE JOHN. A companion of Robin Hood, the lieutenant of the band of outlaws. His real name is said to have been John Nailor. He was exceedingly powerful, and was the only member of the band who could vie with the chief in shooting.

LITTLEJOHN, ABRAM NEWKIRK (1824-1901). Bishop of Long Island. He was born in Florida, N. Y.; was graduated at Union College in 1845; ordained deacon in the Protestant Episcopal Church in 1848 and priest in 1849; was rector of Christ Church, Springfield, Mass., in 1850; of Saint Paul's Church in New Haven, 1851-60, and at the same time lecturer on Pastoral Theology at Berkeley Divinity School, Middletown, Conn.; rector of the Church of the Holy Trinity in Brooklyn, N. Y., 1860-69. The diocese of Long Island having been constituted in 1868, Dr. Littlejohn was elected its bishop and was consecrated in 1869. He was appointed in 1874 to take charge of the American Episcopal churches in Europe. During the incumbency of this charge, he consecrated the Church of Saint Paul's Within the Walls, Rome, and opened the American Church in Paris. Besides contributions to periodicals, sermons, charges, etc., he published *Individualism, Discourses Before the University of Cambridge, England* (1880), and *The Christian Ministry at the Close of the Nineteenth Century* (1884), lectures before the General Theological Seminary, New York.

LITTLE KANAWHA, kȧ-nạ′wȧ. A river of West Virginia, flowing into the Ohio at Parkersburg (Map: West Virginia, C 3). Its length is little over 100 miles. It is of some importance as an outlet for the products of the lumber and oil regions through which it flows. Slack-water navigation for 40 miles to Burning Springs has been procured by means of locks and dams.

LITTLE LORD FAUNTLEROY. A popular child's story by Frances H. Burnett, originally published in the *Saint Nicholas Magazine* (1885). The title character has given its name to a certain type of child and to a style of dress.

LITTLE MAC. A nickname given by his soldiers to Gen. George B. McClellan.

LITTLE MAGICIAN. A nickname of President Martin Van Buren, given because of his skill in politics.

LITTLE NELL. In Dickens's *Old Curiosity Shop,* a child brought up in the midst of vice and crime, who preserves the beautiful purity of her character in spite of her surroundings. She is the constant companion of her old grandfather, and with him wanders off to escape Quilp, finally dying in a country cottage.

LITTLE PHIL. A nickname given by his soldiers to Gen. Philip H. Sheridan.

LITTLE RED RIDING-HOOD. A well-known fairy tale. Though a very old story, it appears for the first time in its present form in Charles Perrault's *Contes du temps passé,* published in 1697, as "Le petit chaperon rouge." Perrault wrote the tales from a nurse's story, it is said; but they became known in France through Straparola's tales in *Piacevoli notti,* published in 1550, and Basile's *Pentamerone* of 1637.

LITTLE ROCK. The largest city of Arkansas, State capital, and the county-seat of Pulaski County, 130 miles southwest of Memphis, Tenn.; on the Arkansas River, and on the Rock Island, the Choctaw, Oklahoma and Gulf, the Saint Louis Southwestern, the Saint Louis, Iron Mountain and Southern, and other railroads (Map: Arkansas, C 3). It is built on a rocky bluff, 50 feet above the river, which is here spanned by three railroad bridges and a county bridge. The streets are regular and finely shaded. Little Rock is the seat of Philander Smith College (Methodist Episcopal), the Arkansas Baptist College (colored), Maddox Seminary, Arkansas Military Academy, and of the medical and law departments of the Arkansas Industrial University. It has, besides the State Capitol, a United States court-house and a United States arsenal, the State penitentiary, State School for the Blind, the State Lunatic Asylum, and the State Deaf-Mute Institute, Children's Home, Old Ladies' Home, City Hospital, and Saint Vincent's Infirmary. There are the Marquand, Supreme Court, the State and collegiate libraries. The system of public parks includes about 100 acres, the most attractive parks being Glenwood, City and West End. Little Rock has large wholesale interests, and an important trade, by river and rail, in cotton, lumber, agricultural produce, and in its own manufactured products. The more important industrial enterprises include cotton gins and presses, with an extensive output of cottonseed oil and cake; foundries and machine-shops, railroad-shops, planing-mills, granite-quarries, cotton, twine, furniture, and stave factories, flouring-mills, brick and tile works, etc.

The government is vested in a mayor, elected every two years; a unicameral council, and administrative officials as follows: chiefs of police and fire department, city electrician, and police matron, appointed by the executive; city physician, street commissioner, superintendent of public works, and collector, elected by the council; and city clerk, attorney, and police judge, chosen by popular election. The municipal budget balances at over $250,000, the principal items of expense being about $80,000 for schools, $35,000 for the fire department, $30,000 for the police department, including amounts for police courts, jails, reformatories, etc., and $10,000 for the operation of the electric-light plant. Population, in 1860, 3727; in 1880, 13,138; in 1890, 25,874; in 1900, 38,307. Little Rock was settled in 1814. Six years later, with a population of less than 20, it became the seat of the Territorial Government, though it was not incorporated until 1831, when its population numbered about 500. During the Civil War it was captured September 10, 1863, by a Union force under General Steele. Consult Powell, *Historic Towns of the Southern States* (New York, 1900).

LITTLE TIBET. A province of Kashmir. See BALTISTAN.

LITTLETON, lĭt't'l-ton. A town in Grafton County, N. H., 113 miles north by west of Concord; on the Ammonoosuc River and on the Boston and Maine Railroad (Map: New Hampshire, H 4). An elevated location and the superb scenery of the White Mountains contribute to its popularity as a summer resort. The great water-power from the river has developed the manufacturing interests, the principal products being whetstones, gloves, shoes, stereoscopic views, bobbins, and carriages. There is a public library, the building having been presented by Andrew Carnegie. The government is administered by town meetings. Littleton was settled in 1770, and was known as Apthorp until 1784, when it was incorporated under its present name. Population, in 1890, 3365; in 1900, 4066. Consult a sketch in the *Granite Monthly*, vol. v. (Concord, N. H., 1881).

LITTLETON, Sir THOMAS (1402-81). Judge of the Common Pleas and author of *The Tenures*. He was born at Frankley Manor House, in the northern part of Worcestershire, in the year 1402. He was educated at the Inner Temple. His earliest public services were as escheator of Worcestershire, under-sheriff of Worcestershire, and recorder of Coventry. As reader to the Inner Temple he lectured on the Statute of Westminster II., *De Donis Conditionalibus*. In 1453 he became a sergeant-at-law. In 1455, a few days before the opening battle of the Wars of the Roses, he was appointed one of the King's sergeants; and he was reappointed in 1461, when Henry VI. was deposed and Edward IV. assumed the crown. While King's sergeant he had much experience of a judicial nature, being frequently in commissions of the peace, of oyer and terminer, and of assize. In 1466 he was made a judge of the Common Pleas. In 1470, when Henry VI. was restored, Littleton, like the other judges, was reappointed, and he was also reappointed in 1471, when Edward IV. displaced Henry VI. permanently. While judge of the Common Pleas he was in many commissions of oyer and terminer and of the peace, particularly for Worcestershire and counties to the west and north. In 1475 he was made by Edward IV. a Knight of the Bath. He died in 1481, and was buried in Worcester Cathedral. His tomb, prepared by himself, is still in existence; but part of the decoration, including a brass plate that contained Littleton's portrait, has disappeared. The famous treatise by which Littleton is best known, *The Tenures*, was written toward the close of the author's life, and gives a picture of the law of land under the feudal system. It is noted for accuracy and clearness. The first edition appeared in 1481 or 1482, being one of the earliest books printed in London, and the earliest treatise on English law printed anywhere. The printers of this edition were Lettou and Machlinia. The second edition was printed about 1483, in London, by Machlinia. The third edition was printed about 1490, at Rouen, by William le Tailleur. These editions and many others were in the original Law French. There have also been many editions in English. In 1628 appeared the celebrated commentary of Coke. There have been about twenty-five editions of Coke upon Littleton, and about ninety editions of *The Tenures* without the commentary. With or without commentary, *The Tenures* formed an important part of legal education for almost three centuries and a half. For biographical and bibliographical details, consult the introduction to the 1903 edition of *The Tenures* (Washington).

LITTLE TURTLE (?-1812). A celebrated Indian chief of the Miami nation, distinguished for his ability, shrewdness, and courage. He commanded the Indian force which defeated General Harmer on the Miami River in 1790, and that which defeated General Saint Clair at Saint

Mary's in 1791; participated in the battle of Fallen Timbers in 1794, and was one of the chiefs who signed the Treaty of Greenville in 1795. In 1797 he visited President Washington in Philadelphia.

LITTLE WOMEN. A popular child's story by Louisa M. Alcott (1868).

LITTORAL DEPOSITS. See SANDSTONE; CONGLOMERATE; etc.

LITTORALE, lĭt'tō-rä'lȧ. A district of Austria. See KÜSTENLAND.

LITTORINA. See PERIWINKLE.

LITTRÉ, lē'trā', MAXIMILIEN PAUL ÉMILE (1801-81). A French lexicographer, philosopher, and physician, born in Paris, February 1, 1801. The life of Littré was neither brightened nor marred by dramatic incidents. His history is that of his mind, which was one of the most clear and energetic of the nineteenth century. Littré's capacity for work was prodigious, his interests universal. Having studied at the Lycée Louis-le-Grand, he became secretary to Count Daru; then he was a student of medicine and an intern. The death of his father set Littré to teaching modern languages and mathematics, but meanwhile he was deep in the ancient tongues, including Sanskrit, and may have studied Oriental languages. He shared in the upheaval of 1830 as a democrat, working with Armand Carrel on the *National*. In 1839 he joined the Académie des Inscriptions et Belles-Lettres. About the same time he espoused positive philosophy, but his mind sought other paths than Comte's. Auguste Comte (q.v.) lacked Littré's knowledge of biology. Littré was less mathematical than Comte, but Littré would have nothing to do with the mysticism of Comte's old age, and was therefore cast off by that philosopher. In 1871 Littré, who had against his will lived in Bordeaux during the siege of Paris, was made professor of history and geography at the Ecole Polytechnique at Bordeaux, but he lectured only once. December 30, 1871, eight years after his first candidacy, Littré was elected to the chair left empty by Villemain in the Academy. In 1871 Littré was a member of the National Assembly, and in 1875 he was elected life member of the Senate. To medicine Littré contributed *Choléra oriental* (1832), a translation of Hippocrates (1839-61), and, with Robin, a new edition of Nysten's *Dictionnaire de médecine*. In this work occurs his definition of man as "a mammal of the order of primates, of the class with two hands," etc.—a definition which enraged Dupanloup. Littré's *Médecine et médecins* (1872) and his translation of Müller's *Handbook of Physiology* (1846), with his translation of Pliny's *Natural History* (1848), are notable, as is the translation of Strauss's *Life of Jesus* (1839-40); but Littré's greatest work is the *Dictionnaire de la langue française* (5 vols., 1866-77), which he was encouraged to make by his friend the publisher Hachette (q.v.). Littré was well fitted for his task. His vast learning, his previous experience in lexicography, his lucidity, his patience, and his energy stood him in good stead. Above all, Littré began his *Dictionnaire* when Romance philology had already become modern, and he knew how to avail himself of the best. The history of this thesaurus Littré has told in *Comment j'ai fait mon dictionnaire* and in the *Préface*. Without the dictionary, Littré's deep scholarship would survive potently in his *Origines organiques de la morale* (1870), in his *Poésie homérique et l'ancienne poésie française* (1847), in his various researches in positivism, or in his contributions to the *Journal des Savants*, and to the *Histoire littéraire de la France*. The personality of Littré is charmingly revealed in his *Etudes et glanures* (1880). He was simple of heart, high-minded, and even-tempered.

Consult: Sainte-Beuve, *Notice sur M. Littré, sa vie et ses travaux*, in the *Nouveaux Lundis*, vol. v. (Paris, 1863); Dupanloup, *Avertissement aux pères de famille*, a pamphlet (ib., 1863); Caro, *Littré et le positivisme* (ib., 1883); Pasteur, *Discours de réception à l'Académie Française* (ib., 1882); Renan, *Discours en réponse à celui de Pasteur* (ib., 1882); Sainte-Hilaire, *Souvenirs personnels sur Littré* (ib., 1895).

LITTROW, lĭt'trōv, JOSEF JOHANN VON (1781-1840). An Austrian astronomer and mathematician, born at Bischofteinitz, Bohemia. He was professor of astronomy in the University of Vienna, and director of the observatory, which owes to him a thorough reorganization. His lectures were extremely popular. His published works include *Theoretische und praktische Astronomie* (1821-27), *Atlas des gestirnten Himmels* (3d ed. 1866), and other scientific treatises, besides an excellent popular exposition of the principles of astronomy, entitled *Die Wunder des Himmels* (8th ed. 1894).

LITTROW, KARL VON (1811-77). An Austrian astronomer, born in Kasan, the son of Josef Johann von Littrow, whom he succeeded in 1842 as director of the Vienna Observatory. The publication of the meteorological records of the observatory from 1755 on was due to his efforts, and he brought the *Annalen* of the observatory to a high grade of scientific perfection. He devised a new method of reckoning longitude at sea, edited his father's works, adding largely to his *Wunder des Himmels*, and wrote a valuable *Verzeichnis der geographischen Ortsbestimmungen* (1844-46) and *Populäre Geometrie* (1839).

LITUITES, lĭt'ū-ī'tēz (Neo-Lat., from Lat. *lituus*, augur's staff). A genus of fossil tetrabranchiate cephalopods allied to Nautilus, found in rocks of Ordovician and Silurian age. The shell in its young stages resembles that of the primitive Nautilus in being closely coiled, but in its adult condition the last whorl straightens out and grows at a tangent to the coiled portion to form a long straight shell, in much the same manner as does the shell of the Cretaceous Baculites (q.v.). This straightening of the last whorl shows among the later species of Silurian time in much younger individuals than it does in the earlier species of Ordovician time; and thus affords an illustration of accelerated development of an acquired characteristic. See Hyatt, "Phylogeny of an Acquired Characteristic," in *Proceedings of the American Philosophical Society*, vol. xxxii. (Philadelphia, 1894).

LITURGICAL MUSIC. See SACRED MUSIC.

LITURGY (Gk. *λειτουργία*, *leitourgia*, service, from *λειτουργός*, *leitourgos*, minister, from *λεῖτος*, *leitos*, public + *ἔργον*, *ergon*, work). A form of public worship, especially for the celebration of the Lord's Supper. The word is frequently used in the Septuagint translation of the

Old Testament to denote the great public service of the Hebrews, the sacrifices of the Temple, and the work of the priests. Thence it passed into the New Testament, where it is used for any ministry, including the ministry of the worship of the Church. Its ecclesiastical use was soon limited to the public religious service, and especially to the Lord's Supper, which is still called in the Greek Church 'the Divine Liturgy.'

From the days of the Apostles there has been a form of worship connected with the Lord's Supper, no doubt reproducing in more or less detail the ritual and ceremonies of the first institution of that Sacrament by Christ. This form was influenced probably in some degree by the old Jewish Passover ritual, and numerous attempts have been made to trace the connection. The references to the liturgy in the first three centuries are not very numerous, but by a comparison of these we are led to think that in the ante-Nicene period there was a form of service very similar in all parts of the Church. Such a form may very probably he found in the early documents from which the Eighth Book of the Apostolic Constitutions was compiled, but whether this form was reduced to writing or was a matter of tradition is a disputed point.

With the conversion of Constantine a new epoch in the history of the Liturgy begins. The influx of large numbers of the higher classes into the Church, the decay of the catechumenate, the building of large and magnificent places of worship resulted in the enrichment of the service and the elaboration of the ritual.

In various parts of the Empire the development was different, and as a result we have a number of types of liturgy resembling each other in their main features, but differing in details; in all of them the service is divided into two great parts, the first devoted to instruction and consisting of the reading of Scripture, sermon, and prayers. To this part of the service all were admitted, and it received the name of *Missa Catechumenorum*, or the Mass of the Catechumens.

The second part was reserved for those who were to partake of the Sacrament and was called *Missa Fidelium*, or Mass of the Faithful; this began with the kiss of peace, then followed the offering of the bread and wine, the *Sursum Corda*, Preface, the great prayer of thanksgiving (Eucharist) including the words of institution; this was followed by the invocation of the Holy Spirit upon the elements and intercession for the living and dead. After this, the consecrated elements were distributed, with a formula, and the service ended with a prayer of thanksgiving and the dismissal of the faithful. The names *Missa Catechumenorum* and *Missa Fidelium* are of Western origin, but the Greek liturgies are divided on nearly similar lines into Pro-anaphora and Anaphora.

The two great classes of liturgies, the Eastern and the Western, may be subdivided into families. The best division of the Eastern liturgies is into national rites.

The *Syrian rite* had its centre at Antioch and is at present represented by the Greek liturgy of Saint James still used on the festival of that saint at Zante. Some account of the earlier form of this liturgy can be gathered from the earlier writings of Saint Chrysostom. The Maronite Church of Mount Lebanon still uses a Syriac version of this liturgy. The services in the early Church at Jerusalem as reconstructed from the writings of Saint Jerome and Saint Cyril, and the *Peregrinatio* of Saint Silvia show a very strong resemblance to this liturgy; it is also closely related to the liturgy found in the Apostolic Constitutions and known as the Clementine liturgy.

The *Persian rite*, now used by the sect of Nestorians, is represented by the liturgy of *The Apostles Addai and Mari*. The centre of this rite is at Edessa. There is one common proanaphora, to which may be attached numerous anaphoras. The language is Syriac. Within recent years many of these Nestorians have joined the Orthodox Eastern Church and use its liturgy.

The *Byzantine rite* is the most important of all the Eastern rites and is used throughout the world in many different languages. It is the rite of the great Russian Church, of the Greek Church, and of other smaller communions. There are three liturgies in this rite, that of Saint John Chrysostom, that of Saint Basil, and that of Saint Gregory Dialogos or the Presanctified. The two latter are used only on special days, while that of Saint Chrysostom is the ordinary liturgy. It is this rite which is used in the Greek churches in America. The *Armenian liturgy* is a daughter of the Byzantine, though in its present form it has been influenced by the Roman.

The *Egyptian rite*. In a manuscript recently discovered on Mount Athos and first published in 1899 we have a collection of liturgical prayers used by Bishop Serapion, a friend of Saint Athanasius. It is probably not later than A.D. 350, giving us the earliest known form of the Egyptian service, and should be compared with the more developed form in the liturgy of Saint Mark, which is the typical Egyptian liturgy. The Copts still use a version of this liturgy.

In many of the Eastern communities there is a *Uniat rite* which is a compromise between the Orthodox and the Roman forms, but usually contains the Roman Canon of the Mass.

The Western liturgies may be divided into the Latin and the Vernacular; the former represented now by the Roman Mass and the latter by the various Protestant liturgies.

The earliest references to the *Latin liturgy* of the West are found in the writings of the North African School, and it was probably in North Africa that the first Latin liturgy was used. At Milan Saint Ambrose took great interest in the development of the service; as a result we have the liturgy which bears his name and is still used in the diocese of Milan. The early Gallican liturgies were supplanted after Charlemagne by the Roman; and we know them only from such remains as have come down to us and are published in Mabillon, Mone, and others. The Christians in Spain under Arab rule used what is known as the Mozarabic liturgy, a form of which, revised by Cardinal Ximenes, is still in use in a few churches in Toledo. The Celtic or British Church also had its own liturgy, which bears distinct traces of a connection with the Oriental rites. After the time of Saint Augustine (A.D. 597) the older form gave way gradually to the form introduced by him, which was a modified form of the Roman. Before the Reformation there had developed in England a number of diocesan *Uses*, which, however, affected the Eucharistic office but little. The most famous of these 'uses' was the Sarum, which just before the Reformation was very widely used. From it was taken much of the present service of the Church of England.

The earliest extant form of the Roman liturgy or *Mass* is found in the 'Leonine Sacramentary,' probably compiled about A.D. 550. Later forms are found in the Sacramentaries of Gelasius and Gregory the Great. From the eighth century on, Rome has striven to enforce uniformity in ritual and has succeeded in supplanting the various Latin uses until to-day her followers, with very few exceptions, use the same form of liturgy in all lands and all churches. See MISSAL.

The *Vernacular liturgies* of the West are the product of the Reformation. The leaders both in Germany and England tried at first to reform the Latin service, but soon abandoned it for a vernacular form. The earliest attempts were made in Germany between 1520 and 1526. In the latter year appeared Luther's German Mass, and from that time a large number of German services were compiled, some following the old Latin, while others made radical changes. The followers of Luther were inclined to be conservative, while those of Zwingli were more radical. A comparison of the Lutheran liturgies or *Agendas* of the sixteenth century shows a certain type of service which may be called normal, consisting of: (1) Introit; (2) Kyrie; (3) Gloria in excelsis; (4) collect; (5) epistle; (6) alleluia; (7) gospel; (8) creed; (9) sermon; (10) general prayer; (11) preface; (12) Sanctus and Hosanna; (13) exhortation to communicants; (14) Lord's Prayer and words of institution; (15) Agnus Dei; (16) distribution; (17) post-communion thanksgiving; (18) benediction. With the rise of rationalism in the seventeenth century the older forms of liturgies gave place to a very bald, bare service, in which the congregation had no part. A revival and return to earlier forms began with the publication in 1822 of the *Kirchenagenda* for the Court and Cathedral Church of Berlin, and since that time new and revised agendas have been introduced in nearly all the German States, among the most important of which is the *Agende für die Evangelische Landeskirche* introduced into Prussia in 1894.

The first agenda of the Lutheran Church in America was the work of H. M. Muehlenberg in 1747. At present either 'The Church Book' of 1891 or 'The Common Service' of 1888 is used; but neither of these is rigidly enforced. Both of them represent a return to the earlier type of the sixteenth century.

Zwingli set forth a communion service for the Reformed Church in 1525, which was to be used once a year in Holy Week. This was the liturgy used at Zurich as late as 1675. The form of liturgy recommended by Calvin is found in his *Manner of Celebrating the Lord's Supper*. After the sermon there was a long prayer, including a petition for the worthy reception of the sacrament; then followed: (a) The Scripture lesson I. Cor. xi. 25-29; (b) an address warning all to examine themselves; (c) the communion, the elements given with a formula—during the reception Psalm cxxxviii. is sung; the celebration closes with (d) the prayer of thanksgiving, (e) Song of Simeon, and (f) the blessing. The service is that now used in the Reformed Church of America, and was introduced in a modified form into Scotland by John Knox in his *Book of Common Order*, and used until his death. This book gave great latitude for extempore prayer. Besides the office for the holy communion it contained various other services and alternate forms. In 1644 the Westminster Assembly adopted the Directory of Public Worship, in which the office for the holy communion is stripped almost entirely of its liturgical form, and room is made for the minister to use his own compositions. The communicants sit instead of kneeling at the Lord's Table. The minister reads the words of institution, then offers a prayer of blessing, and distributes the bread and wine with a formula. After all have communicated the minister is to give solemn thanks to God.

The form of communion service used in the churches of the Anglican communion is found in the *Book of Common Prayer* of these churches. In character it occupies a ground between the liturgies of the Reformed and Lutheran churches on the one side and the Roman on the other. This service was first printed in 1549, and has been revised a number of times both in its English and American forms. The most marked peculiarity of the American form is due to the influence of the Scottish Nonjurors' office. See PRAYER-BOOK, COMMON.

Beginning with the Oxford movement in England in the first half of the nineteenth century there has been a remarkable revival in the study of liturgies both in England and America, and many Christian bodies have shown an increasing tendency to introduce liturgical forms into their services.

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LITURGY, JEWISH. See SYNAGOGUE.

LITUUS. See SPIRAL.

LIUDGER, lē'ụd-gẽr, SAINT (c.744-809). The first Bishop of Münster, in Germany. He was born in Friesland, but received his education in England, where he studied under Alcuin (q.v.). On his return to the Continent he sought to convert his fellow-countrymen to Christianity, but in 784, at the time of Wittekind's mission to Friesland, temporarily abandoned the work and made a journey to Rome. Afterwards he resumed his missionary labors and became the first Bishop of Münster. The various *Vitæ Sancti Liudgeri* have been published by Diekamp in four volumes entitled *Geschichtsquellen des Bistums Münster* (1881). For his life consult: Hüsing (Münster, 1878); Pingsmann (Freiburg, 1879); and Krimphove (Paderborn, 1886).

LIUDPRAND, lē'ụd-prȧnd, **LIUTPRAND,** or **LIUZO,** lyōō'tsō (c.922-c.972). An Italian historian, to whom we owe much of our knowledge of the history of Italy in the tenth century. He came of a noble Lombard family. His father was ambassador of King Hugo of Italy to Constantinople in 927, and died soon after. Liudprand was thereupon educated at the dissolute Court of Hugo, but was early destined for the Church, being ordained deacon in 931. Nevertheless he was, throughout his life, better versed in pagan learning than in Christian lore, and in his works biblical quotations are interwoven with many excerpts from Cicero, Vergil, Horace, and Ovid. After Hugo's power began to wane, Liudprand turned toward Berengar II. (q.v.), and obtained a position in the new ruler's chancery. In 949 he went on an embassy to Constantinople, but soon thereafter he had a dispute with Berengar, and we do not hear of him again until 956, in which year he appeared at the Court of King Otho of Germany. At the request of Bishop Recemund of Elvira, he began in 958 his best work, the *Antapodosis*. In it he attacks Berengar and his Queen, Nilla, but also treats of the Italian history in the period 886 to 949. He is not impartial, but interesting and learned. In 962 Otho the Great made him Bishop of Cremona, whence he is spoken of as Liudprand of Cremona. Throughout the Germanic invasion of Italy he played an important rôle, and in 968 he went to Constantinople to seek the hand of a Byzantine princess for the future Otho II., but the Emperor Nicephorus (q.v.) refused the proffered alliance. We have the experiences of this embassy preserved in Liudprand's *De Legatione*. He died soon after his return. There is no foundation for the statement so often made that Liudprand also took part in the later successful embassy to Constantinople, which obtained the hand of Theophano for Otho II. Besides the two works mentioned above Liudprand also wrote: *De Rebus Gestis Ottonis Magni Imperatoris*, covering the period from 960 to 964. The best edition of his works is in the *Monumenta Germaniæ Historica* (Berlin, 1839), published separately (Berlin, 1877). Consult: Köpke, *De Vita Liutprandi* (Berlin, 1842); Wattenbach, *Deutschlands Geschichtsquellen*, vol. i. (6th ed., Berlin, 1893-94); Osten-Sacken, "Aus Liudprands Werken," in *Geschichtsschreiber der deutschen Vorzeit* (2d ed., Leipzig, 1890).

LIU-KIU (lyōō′ kyōō′) **ISLANDS.** A group of islands belonging to Japan. **See LOO-CHOO ISLANDS.**

LIUTPRAND, lē-ụt′prȧnd (c.690-744). A king of the Lombards (712-744), under whom they rose to their greatest power. He took advantage of the political confusion of Italy to attack and conquer Ravenna (728). In 739 he made an alliance with Charles Martel against the Arabs, and three years later defeated the Dukes of Beneventum and Spoleto. The result of his legal activity was the *Edicta Liutprandi*.

LIUTPRAND. An Italian historian. See LIUDPRAND.

LIVADIA, lĭv′ȧ-dē′ȧ (Lat., from Gk. *Λεβάδεια*, *Lebadeia*). A town of Greece, capital of the Nomarchy of Bœotia, situated on the western edge of the plain formed by the draining of Lake Copais. In ancient times it derived its chief importance from the subterranean oracle of Trophonius (q.v.). Under Turkish rule it was the most important town in Northern Greece and gave its name to the Province of Livadia. The town lies at the entrance of the wild and picturesque gorge of the Hercyna, at the foot of a steep hill crowned by a ruined castle, attributed to the Catalan Company. The site of the cave of the oracle is not with certainty identified. Population, in 1896, 6494.

LIVADIA, lē-vä′dē-ȧ. An estate of the Russian Imperial family on the southern coast of the Crimea, Russia, situated about three miles southwest of Yalta (Map: Russia, D 6). It consists of two palaces surrounded by extensive parks and gardens. In the vicinity are situated numerous villas and palaces belonging to the Russian nobility. Alexander III. died at Livadia on November 1, 1894.

LIVE-FOREVER. A perennial herb. See HOUSELEEK.

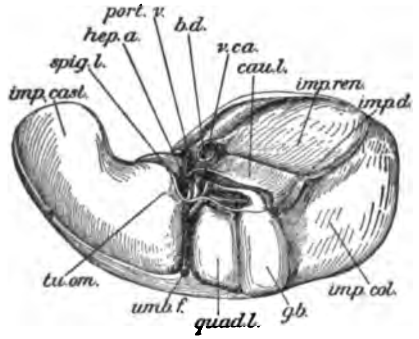
LIVE OAK. See OAK.

LIVER (AS. *lifer*, OHG. *libara*, *lebara*, Ger. *Leber;* probably connected ultimately with Lat. *jecur*, Gk. *ἧπαρ*, *hēpar*, Arm. *lcard*, Skt. *yakṛt*, liver). The largest gland in the body; it weighs from 3 to 4 pounds, and measures about 12 inches from side to side, and 6 or 7 inches from its anterior to its posterior border. It is situated in the right hypochondriac region, and reaches over to the left. It is thick and indented behind, where it crosses the convex bodies of the vertebræ, convex on its upper surface, where it lies in the concavity of the diaphragm; and concave below, where it rests against the stomach, colon, and right kidney. This lower surface presents a fissure dividing the organ into a right and a left lobe.

The liver is retained in its position by five ligaments. Besides the right and left lobe, there are three smaller lobes. The great bulk of the organ is, however, made up of the right lobe, which is six times as large as the left.

The vessels of the liver are the hepatic artery, a branch of the cœliac axis (see AORTA), which supplies the organ with nutrient blood; the portal vein, which conveys to the liver the venous blood of the intestines, spleen, and stomach; the hepatic veins, which convey the blood from the liver into the inferior vena cava; the hepatic duct, which carries off the bile from the liver; and the lymphatics.

The liver, both on its surface and internally, is of a dark reddish tint. The substance of the organ is composed of lobules held together by extremely fine areolar tissue, and ramifications of the minute branches of the various hepatic vessels. Each lobule is composed of a mass of hepatic cells, of a plexus of biliary ducts, of a portal plexus (from the contents of which the cells obtain the biliary matters that are found in their interior), of a branch of the hepatic vein, and of minute arteries. The exact mode in which the bile formed in the cells makes its way into the ducts is not known. The numberless minute ducts gradually run into one another, until, as they emerge from the lower surface of the liver, they are reduced to two large trunks, which soon unite to form the hepatic duct. Into the hepatic duct, the cystic duct from the neck of the gall-bladder (presently to be described) enters, and the two combine to form the common duct (*ductus communis choledochus*), which opens into the duodenum. (See DIGESTION, ORGANS AND PROCESS OF.) This common excretory duct of the liver and gall-bladder is about 3 inches in length, and of the diameter of a goose-quill.

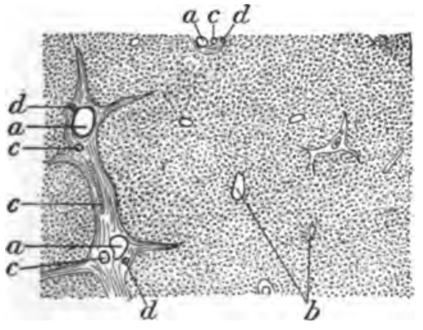


INFERIOR SURFACE OF HUMAN LIVER.

Imp.cast., Impressio gastrica; *spig.l*, spigelian lobe; *hep.a*, hepatic artery; *port.v.*, portal vein; *bd.*, bile-duct; *v.ca.*, vena cava; *cau.l.*, caudate lobe; *imp.ren.*, impressio renalis; *imp.d.*, impressio collica; *tu.om.*, tuber omentale; *umb.f.*, umbilical fissure; *quad.l.*, quadrate lobe; *g.b.*, gall-bladder.

The chemical composition of the liver in health is as follows: 68.6 per cent. of water, and 31.4 per cent. of solid constituents—of which 3.8 are fat, 4.7 albumen, while the rest is made up of vessels, salts, and extractive matters. (In the diseased condition known as fatty degeneration of the liver, the fat is enormously increased.) Sugar, varying in amount from 1 to 2 per cent., is also found; and inosite, uric acid, sarcine, xanthine, and leucine usually occur in traces.

The gall-bladder may be regarded as a *diverticulum* or offshoot from the hepatic duct. It has somewhat the shape of a pear, and lies in a depression on the under surface of the liver. Its use seems to be to serve as a reservoir for the accumulation of the bile, when its flow into the intestine is interrupted, as it is always found full after a long fast, and empty when digestion is going on. That the gall-bladder is not an essential appendix to the liver is shown by the fact that it is absent in many genera of mammals.



SECTION OF HUMAN LIVER,

Showing general arrangement of lobules: *a*, interlobular (portal vein); *b*, intralobular (hepatic) vein; *c*, hepatic artery: *d*, bile-ducts; the boundaries of the lobules are imperfectly defined by the irregular areas representing the poorly developed capsule of Glisson.

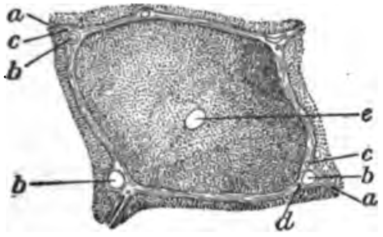
It was formerly believed that the liver served merely for the separation of the biliary secretion from the blood; but there is now abundant evidence that the blood itself is changed by its means, in such a way as to show that this gland possesses an *assimilating* as well as a *depurating* action. That the liver possesses an assimilating power on albuminous substances is shown by the experiments of Claude Bernard, who found that, if a solution of egg-albumen be injected into any part of the systemic circulation, albumen speedily appears (like other soluble substances which are foreign to the body) in the urine, and is eliminated as an extraneous matter; but if it be injected into the portal vein, it does not appear in the urine, but becomes a normal constituent of the blood (blood-albumen), through the agency of the liver. Further, it appears from Bernard's researches that fatty matters are elaborated in the liver—the blood of the hepatic veins, which leaves the liver, containing considerably more fat than that of the portal vein, which enters it. Some of this fat is doubtless burned off in the lungs; but if a deficient supply should be introduced by the lacteals, some of it would doubtless be applied to the formative processes. Lastly, during the last three days of incubation of the chick, the liver is made bright yellow by the absorption of the yolk, which enters the branches of the portal vein, and is then converted partly into *blood-corpuscles*, which enter the circulation, and partly into bile, which is discharged into the intestine. Hence, there is distinct evidence, from several points of view, that the liver is an *assimilating* organ. The *depurating* action of this organ is exhibited in the secretion of bile (q.v.), by which the hydro-carbonaceous portion of the effete matters of the blood is removed, just as the nitrogenous portion is eliminated by the kidneys. The use of the bile in the digestive process is sufficiently explained in the article DIGESTION, ORGANS AND PROCESS OF.

This important gland first shows itself in the form of yellowish-brown cells in the polyps, and gradually becomes more concentrated and developed in the echinoderms, annelids, nudobranchiate gastropods, insects, crustaceans, air-breathing mollusks, cephalopods, fishes, reptiles, birds, and mammals. The physiological anatomy of the liver may be briefly stated as follows: The lobules previously mentioned are about $\frac{1}{15}$ of an inch in diameter and of an ovoid shape. They are surrounded by a plexus of blood-vessels, nerves, and ramifications of the hepatic duct, comprising what are called the interlobular vessels. These are all inclosed by a sheath which is a prolongation of the proper coat of the liver (capsule of Glisson), but attached loosely by areolar tissue. This sheath follows the vessels to the subdivisions within the interlobular spaces (spaces between the lobules), but does not extend to the capillary vessels *within* the lobules. In a few animals, as the pig and polar bear, the lobular structure can be seen with the naked eye, but in man and most mammals it cannot. The lobules are intimately connected with each other, branches of the interlobular vesels being each distributed to several of the lobules. Any one lobule, however, may be considered as representing the physiological anatomy of the whole liver, and the study of its anatomy and functions will answer for the study of the whole gland. The lobules receive blood at their surfaces from the capillary terminations of the portal vein, these vessels having received the terminations of the hepatic artery before passing into the lobules. It is very important to bear in mind this peculiarity of distribution, which is often overlooked. The branches of each hepatic vein, the vessel which carries the blood from the liver to the ascending great vein (ascending vena cava), by which it is returned to the heart and lungs, have their origin *within* the lobules. Their capillary extremities arise from the capillary ramifications of the portal vein, and, passing toward the centre of the lobule, converge into three or four radicles, which, uniting at the centre, form the *intralobular* veins, which are the commencement of the hepatic veins. These intralobular veins, which are in the centre of each lobule, are from $\frac{1}{1000}$ to $\frac{1}{500}$ of an inch in diameter, and they follow the long axis of the lobule, receiving vessels in their course till they empty into larger vessels situated at the base of the lobules, called by Kiernan sub-lobular veins. They collect the blood from all parts of the liver, and, increasing in size by union with one another, they at last form the three hepatic veins which discharge the blood from the liver into the ascending vena cava. Now, these hepatic veins are a long way from the influence of the heart's action, lying as they do between the portal circulation and the veins going to the heart; but a provision has been made to assist in the propulsion of their contents, and they are supplied with a muscular coat, composed of unstriated muscular fibres. The most essential elements of the lobule, or of the liver, are the hepatic cells, which are the true secreting elements of the gland. They are minute, polygonal-shaped bodies about $\frac{1}{1000}$ of an inch in their longest and $\frac{1}{1500}$ in their shortest diameter, having one nucleus, or sometimes two nuclei, with some granular matter. (See CELL.) They are surrounded by an independent network of extremely minute vessels $\frac{1}{10.000}$ of an inch in diameter, of uniform size throughout, called the biliary capillaries, and in which the bile first makes its appearance.

The liver is an organ which has no analogue in any of the other organs of the body. It has two distinct functions, and a cellular arrangement entirely unlike that seen in any other gland. It is excretory on the one hand and secreting on the other, and it is its secreting function which has been so long overlooked, and the knowledge of which has also thrown so much light on the physiology of what are called ductless glands, like the spleen (q.v.) and the lymphatic glands. The liver, in one of its functions, is a ductless gland. It secretes (that is, not merely separates, but forms) a substance which is not carried away by any excretory vessel, but which is immediately returned to the blood. The other function of the liver is the production of bile, which, although a true excretion, answers a salutary purpose.

As the bile-ducts increase in size they contain numerous follicles and cluster-like glands which are called racemose (the biliary acini of Robin), and they continue to occupy the biliary passages as far as the *ductus communis choledochus*, or the common bile-duct, which empties into the intestinal canal. Those which are found in the smallest ducts are simple follicles from $\frac{1}{500}$ to $\frac{1}{400}$ of an inch in length. The larger of these glands are formed of groups of these follicles, and are from $\frac{1}{200}$ to $\frac{1}{100}$ of an inch in diameter. The nutrition of the liver is provided for by the hepatic artery, which has three sets of branches. As soon as it enters the sheath formed by the capsule of Glisson, it sends off very fine branches, called *vasa vasorum*, to the walls of the portal vein, to those of the hepatic vein, to its own branches, and an exceedingly rich and beautiful network of branches to the hepatic duct. When the hepatic artery is well injected it almost completely covers the duct with its ramifications. The hepatic duct proper, or that single vessel so called lying outside of the liver, is formed by the union of two ducts, one from the right and one from the left lobe of the liver. It is about an inch and a half long, and joins the duct from the gall-bladder, called the cystic duct, to form the common duct, or *ductus communis choledochus*, which is about three inches long and of the size of a goose-quill, and empties, in common with the pancreatic duct, into the intestine, a little below the middle of the duodenum, or about 5 inches below the stomach. The gall-bladder is an elongated, pear-shaped sac about 4 inches in length and one in breadth, having a capacity of about one and a half fluid ounces. The cystic duct, connecting it with the hepatic duct, is the smallest of the three larger ducts, and is about one inch in length. In the gall-bladder there are also numerous small racemose glands similar to those above mentioned as existing in the biliary ducts generally. They consist each of from 4 to 8 follicles lodged in the submucous tissues. They secrete mucus mixed with bile. The idea has been entertained by some that these biliary racemose glands found in different parts of the biliary ducts were the bile-producing glands, while the hepatic cells were the organs for secreting sugar, or, in other words, for the conversion of the glycogenic matter of the liver into glucose, or grape-sugar; but this view has not been found tenable. The nerves of the liver are derived from the pneumogastric, the phrenic, and from the solar plexus of the great sympathetic. They all penetrate the gland at the great transverse fissure, and follow the blood-vessels in their course of distribution to the various parts of the organ, but their terminal distributions are not yet well understood. The lymphatic vessels of the liver are numerous and consist of two layers. The outer or superficial layer is situated immediately beneath the serous or peritoneal covering. The inner or deeper layer forms a plexus surrounding the lobules, having entered the liver along with the portal veins, hepatic arteries, and bile-ducts, enveloped in sheaths of Glisson's capsule. In their course they invest the branches of both ducts and blood-vessels with a delicate network of tubes, and on arriving at the surface of the lobules they enter them and form another remarkable network of lymphatic passages, traversing the lobule in every direction. Every blood-capillary is enveloped in a lymphatic sheath in very much the same manner that the interlobular vessels are enveloped in the sheath of Glisson's capsule. These lymphatic sheaths surrounding the other vessels are otherwise called the perivascular lymphatic spaces, and are similar in structure to those which are found in various parts of the body. See LYMPHATIC.

HISTOLOGY. The macroscopic divisions of the liver which are known as lobes are subdivided microscopically into lobules by extensions inward of the connective tissue of Glisson's capsule. In some of the lower animals, e.g. the pig, each lobule of the liver is completely surrounded by this connective tissue. In man the amount of connective tissue is small and does not form a complete investment for each lobule. The demarkation of the lobules is, therefore, not at all sharp. The structure of a liver-lobule may be described as follows: At the centre of each lobule is the central vein which is a branch of the hepatic vein. Passing out in a radiating manner from this central vein is a dense network of capillaries in the meshes of which lie the cords of liver-cells. These liver-cells are polyhedral in shape, granular, and contain rather large nuclei. In the connective tissue which lies at the junction of three or more lobules is found the group of vessels known as the portal canal and consisting of the hepatic artery, the portal vein, and the bile-duct. The smaller bile-ducts consist of a single layer of columnar epithelium surrounded by a thin layer of connective tissue. In the larger ducts there is a well-defined mucosa consisting of a single layer of epithelium resting upon a stroma, outside of which are a few smooth muscle-cells and some fibrous tissue. Usually at some distance from the portal system in the connective tissue between two adjacent lobules is the sublobular vein, a branch of the hepatic vein, into which the central veins empty.

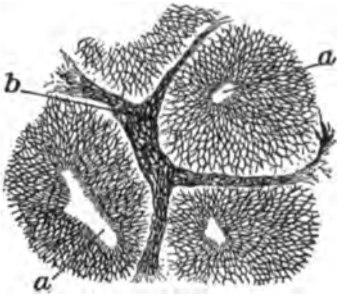


SECTION OF LIVER OF HOG,

Showing very diagrammatically the lobules; *a*, interlobular connective tissue; *b*, *c*, branches of portal vein and hepatic artery; *d*, bile-ducts; *e*, interlobular vein.

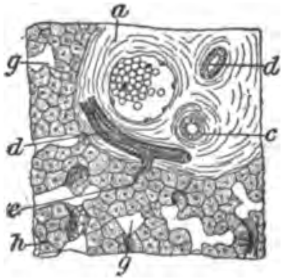
The blood-supply of the liver is very large, being conveyed by two distinct systems—the portal system and the hepatic system. The portal vein and the hepatic artery enter the liver at the hilus, and, entering the organ, divide and subdivide, following the extensions inward of Glisson's capsule. Upon reaching the boundary of the lobules the vessels break up into the intralobular capillary network already referred to. Distinct up to the time of entering the lobule, the blood of the two systems mingles at some point within the lobule capillaries and empties into the above-mentioned central vein, whence it finds its way into the hepatic vein. Bile capillaries extremely minute in size originate within the lobules and follow the cords of liver-cells to the periphery of the lobules, where they empty into the smaller bile-ducts. Lymphatics accompany the blood-vessels, forming in the capsule a superficial lymphatic system, in the substance of the liver proper a deep lymphatic system. The nerves of the liver enter the organ at the hilus in company with the blood-vessels and lymphatics. They are composed mainly of non-medullated fibres, although some medullated fibres are intermingled. They branch following the subdivisions of Glisson's capsule, and reach the periphery of the lobules. Extremely minute fibrils enter the lobules to terminate in end-arborizations among the liver-cells.

The two distinct functions, that of the production of bile and the formation of sugar, which are now generally recognized as being performed by the liver have led some physiologists to suppose that this gland is composed of two distinct portions or anatomical elements, and Robin has adopted this theory and calls one portion of the liver a biliary organ, and the other a glycogenic or sugar-forming organ. The lobules and hepatic cells, with their different vessels, he regards as performing the glycogenic function, and the little racemose glands which are attached to the biliary ducts along their course as the bile-producing organs; and others have entertained ideas of the independence of the sugar-making and bile-producing portions of the organ. But from the fact that bile is commonly found in the lobules, and that the biliary capillaries are connected with the excretory biliary ducts, the conclusion seems to be unavoidable that the bile is formed in the lobules, and, moreover, by the hepatic cells. It therefore becomes a question as to what are the functions of the little racemose glands attached to the larger bile-ducts. They have much the form of mucous glands in other parts of the body, and from the examinations of Sappey, who has found the bile to be viscid in proportion to the number of these glands in the ducts containing it, they appear to be really mucous glands. In the rabbit, an animal in which these glands are not found in this situation, the bile is quite fluid, and free from its ordinary viscidity. It has generally been thought that the bile is secreted exclusively from the



SECTION OF INJECTED HUMAN LIVER,

The capillaries having been filled from the central vein (*a*); *b*, branches of portal vein.



SECTION OF LIVER OF DOG,

Including portion of lobule and interlobular or connective tissue (*a*); *b*, portal vein; *c*, hepatic artery; *d*, bile-ducts; *e*, small peripheral bile-vessel; *g*, blood-channels; *h*, hepatic tissue.

blood which has been brought from the intestines by the portal vein, and that, indeed, the principal office of the liver was to separate effete matter from this portion of the venous system; but many experiments which have been made since Bernard discovered the glycogenic function of the liver go to show this idea erroneous. It has also been thought that the hepatic artery may furnish material for the secretion of bile, while the portal vein furnished that for the production of sugar; but these views again are quite overthrown by many well-established facts and experiments. It has been found that, after the ligation of the hepatic artery, bile has been secreted from blood furnished by the portal vein; and again, according to the experiments of Oré, who has succeeded in gradually obliterating the portal vein without immediately producing death, it has been found that bile is secreted from blood furnished by the hepatic artery. In one instance in which a patient died of dropsy the portal vein was obliterated, and yet the gall-bladder was full of bile. Anomalous cases have been reported where the portal vein, instead of passing through the liver, emptied into the ascending vena cava, and where also there was found no deficiency of bile. These facts point to the conclusion that the secretory elements of the liver have an elective power, and that this gland may elaborate its products either from venous or arterial blood. The only conclusion, therefore, is that the liver produces bile from both the portal vein and the hepatic artery, and that the secretion may be kept up if either one of these vessels be obliterated. The natural color of bile is variable; in the pig it is bright yellow; in the dog, dark brown; and in the ox, greenish yellow. In general, it may be stated that it is dark green in carnivorous, and greenish yellow in herbivorous animals. Its specific gravity is variously stated. Some authorities place it at 1026; others from 1020 to 1026; and again others from 1026 to 1031. These differences are considerable, but the numbers were probably the result of exact observation, as the bile is found to differ under different circumstances. (See table.) Fresh bile is nearly inodorous, but after being taken from the body of an animal it soon undergoes putrefactive changes. It has been generally thought to be invariably alkaline, and this is true of that which is found in the hepatic duct, but it often has an acid reaction after it has passed into the gall-bladder.

The bile contains two classes of constituents, one of which are true secretions, and destined to reënter the system and perform certain functions. They contain, with other matters, some that are formed in the liver, and are no doubt elaborated from materials furnished by the blood. These are the salts included in the accompanying table under the names of taurocholate and glycocholate of soda. Biliverdin, the coloring matter of the bile, is probably a mixture of different coloring principles which undergo rapid change on exposure to the air. It has some analogy to the coloring matter of the blood, and it is also, like the biliary salts, supposed to be formed in the liver. This coloring matter has intense power, and in cases of obstruction of the biliary passages will give the skin and conjunctivæ a decidedly yellow color. Like hæmoglobin, it contains a portion of iron, but the relative amount has never been ascertained. The other constituents of the bile are truly excretory, being composed of effete matter brought by the blood-vessels from the various parts of the system. In this class is cholesterin, which has long been known as a constituent of the bile, whose chemical and physical characteristics were well recognized, but whose physiological relations were not understood. (See CHOLESTERIN.) In regard to the glycogenic function of the liver, it may be stated that nearly all physiologists admit that Bernard demonstrated it completely, although for a long time many apparently well-made experiments seemed to throw great doubt on the subject, some believing that the sugar found by Bernard was a product of post-mortem changes. It is a fact that it is difficult to find sugar in the liver which may not be said to be produced after death; consequently, demonstrative experiments are exceedingly difficult. On examining the blood which comes from the lungs in animals upon which vivisection has been performed it is found to contain no sugar. Other experiments have left no doubt of the fact that, to serve some purpose in the animal economy, sugar is destroyed in its passage through the lungs, the most generally received view being that it is converted into lactic acid, which unites with the alkalies in the blood to form lactates, which again are converted into carbonates. It is thought that among the causes of the disease diabetes is an abnormal performance of the function of respiration (q.v.). The glycogenic matter of the liver, in composition, reactions, and particularly in its readiness to be transformed into sugar, has considerable resemblance to starch, and is called by some authors amyloid matter. On account of its insolubility in water it may be extracted from the liver after all the sugar has been washed out. See LIVER, DISEASES OF THE.

COMPOSITION OF THE BILE ACCORDING TO ROBIN

Water	916.00	to	819.00
Taurocholate of soda	56.50	"	106.00
Glycocholate of soda	traces.		
Cholesterin	0.62	to	2.66
Biliverdin	14.00	"	30.00
Lecithene Margarin, olein, and traces of soaps	3.20	"	31.00
Cholin	traces.		
Chloride of sodium	2.77	to	3.50
Phosphate of soda	1.60	"	2.50
Phosphate of potassa	0.75	"	1.50
Phosphate of lime	0.50	"	1.35
Phosphate of magnesia	0.45	"	0.80
Salts of iron	0.15	"	0.30
Salts of manganese	traces	"	0.12
Silicic acid	0.03	"	0.06
Mucosine	traces.		
Loss	3.43	to	1.21
	1000.00		1000.00

Consult: Morris, *Human Anatomy* (Philadelphia, 1902); Flint, *The Physiology of Man* (New York, 1875); and Flint, *The Excretory Function of the Liver* (Philadelphia, 1877).

LIVER, DISEASES OF THE. The liver is subject to a number of disorders, circulatory, inflammatory, and infectious, some of which originate in the organ itself, while others arise from disorders in other parts of the body. It is intimately concerned with the processes of assimilation and elaboration of food, and dietary indiscretions, especially if long continued, are certain to affect the health of the organ unfavorably.

Biliousness is an unscientific and inaccurate term used to designate a condition which presents the symptoms of languor, headache, dizziness, furred tongue, a tendency to constipation, with perhaps slight yellowing of the skin, and a general sense of atony, depression, and discomfort, and which is popularly supposed to be due to derangement of the liver. It depends not upon an excessive secretion of bile, but upon some perversion of its function or its retention in the bile-ducts. Moreover, most of the symptoms do not depend directly upon changes in the bile, but upon interference with digestion in the stomach and intestines, together with the development and absorption of an infinite variety of poisonous products of decomposition, many of which are muscular poisons. Normally these are not allowed to form, owing to the presence of the bile, but when this is retained in the bile-ducts, its secretion is impaired, and its composition altered, by the disorder of the liver which is a reflex result of the gastric and intestinal irritation. Biliousness is best treated by careful regulation of the diet, avoiding what are called 'rich foods,' sweet wines, and malt liquors. Hepatic activity is to be maintained and stimulated by vigorous outdoor exercise. Massage over the region of the liver and gymnastics which contract the abdominal muscles are useful. Drugs which have an especial action on the liver (cholagogues) are given to promote the flow of bile, and to overcome the constipation. Among the more important of these are mercury in the form of blue mass and calomel, podophyllin, nitro-muriatic acid, and the saline purgatives. Laxative saline mineral waters may be taken in the morning. See BILE.

Acute yellow atrophy is a remarkable disease of the liver in which the gland undergoes rapid degeneration, and diminishes to two-thirds or one-half its normal size. The malady is comparatively rare, and occurs after severe mental emotions, and in people whose constitutions are weakened by dissipation, by syphilis, or (in women) by pregnancy. After a period characterized by indefinite gastro-intestinal symptoms, such as nausea, vomiting, and irregularity of the bowels, the characteristic features of the disease appear. These consist of jaundice and marked cerebral disturbances, viz. headache and restlessness, then delirium and gradually developing coma, with convulsive twitchings toward the end. The disease is almost invariably fatal within a few days after the severe symptoms begin.

Congestion of the liver may be active or passive. Active congestion occurs in the course of fevers, and must form a part of acute inflammatory processes. Passive congestion is caused by diseases of the heart or lungs, which interfere with the return of blood through the gland. A severe form of passive congestion is known as *nutmeg liver*, and results from valvular disease of the heart. The organ enlarges considerably and becomes darker in color and in advanced conditions acquires a peculiar appearance of red, yellow, and white mottling.

Inflammatory processes in the liver may be acute or chronic, and comprise perihepatitis, abscess, and cirrhosis. Perihepatitis is a gradual thickening of the capsule of the liver caused usually by chronic alcoholism, syphilis, or the chronic peritonitis that sometimes accompanies Bright's disease. In some cases the thickened capsule contracts and produces marked interference with the circulation of the organ, which assumes an almost globular form. The portal circulation in particular may be obstructed, and symptoms similar to those mentioned under cirrhosis result.

Abscess of the liver arises from the introduction into it of some septic agent through the circulation or through the bile-ducts, and may be multiple or single. The single or solitary abscess is common in tropical countries, often follows an attack of dysentery, and is thought to be caused by the *Amœba coli*. Solitary abscesses often reach an enormous size, and the pus may make its way into the peritoneal cavity, or into the pleural cavity, where it may perforate the lung and be discharged by coughing; or it may point through the skin. These abscesses are best treated by evacuating the pus by surgical means. Multiple abscesses are usually a result of pyæmia (q.v.) and are very fatal.

Cirrhosis (κιῤῥος, yellow), or chronic interstitial hepatitis, is a slow inflammation of the liver which results in an extensive growth, usually in the course of the portal canals, of a fibrous contractile tissue which compresses and destroys the secreting cells and seriously obstructs the circulation of the blood through the portal system of veins. The disease may assume two forms: hypertrophic cirrhosis, in which the organ is greatly enlarged and its surface smooth; and atrophic cirrhosis, in which the gland is reduced often to less than half its normal size, and the surface is rough or nodular ('hobnail liver') from the irregular contraction of bonds of fibrous tissue. In the great majority of cases cirrhosis is caused by the excessive use of alcohol in the form of beer, wine, or spirits. The symptoms are characteristic, especially in advanced cases. Obstructive circulatory disturbances are manifested in the stomach by nausea and vomiting, sometimes of blood; in the lower intestinal tract by hemorrhoids, and in the abdominal cavity by ascites. In this form of dropsy the effused fluid may amount to three or four gallons. Jaundice is a symptom more apt to occur in the hypertrophic than in the atrophic variety of cirrhosis. The disease is very intractable, but some patients live for years in comparative comfort with proper treatment. The taking of alcohol must be stopped entirely; the diet must be light but nutritious; and the bowels kept active. When ascites supervenes, attempts are made to promote its absorption by giving diuretic and purgative drugs; but it is often necessary to draw the fluid off repeatedly by puncturing the abdominal wall.

Fatty liver may be the result of an excessive deposit of fat cells in the organ, in cases of general obesity, or in emaciating diseases such as phthisis, or it may be a true degeneration in which the tissue elements are replaced by fat. The latter change takes place in acute yellow atrophy (see above), and notably in phosphorus poisoning. The liver is enlarged, smooth, its edges are rounded, and it is yellowish-white on section.

Amyloid or *waxy liver* occurs in association with lardaceous disease in other organs—the brain, spleen, stomach, kidneys, and intestines. It is attributed to long-standing suppuration from phtsisis, syphilis, tubercular disease of the bones or joints, and to empyema. Treatment depends upon removing the cause of suppuration. See WAXY DEGENERATION.

The liver may be the seat of tuberculosis, cancer, and syphilis. Tuberculosis occurs only as a part of a general infection. (See Tuberculosis, section on the *Liver.*) In cancer the gland becomes enlarged, hard, and nodular and irregular in outline. The disease is hopeless and treatment only palliative. Syphilis of the liver may be hereditary or acquired. In the first form it occurs as an interstitial hepatitis, in the second as a gummatous deposit during the third stage of the disease. See Syphilis.

Hydatid cysts are found in the liver more often than anywhere else in the body. These are caused by a minute intestinal tapeworm—*Tænia ecchinococcus.*

See also Calculus; Bile; Jaundice; and Cirrhosis.

LIVER-FLUKE. See Fluke.

LIVERMORE, Mary Ashton (Rice) (1821-1905). An American reformer. She was born in Boston, and was educated in the Charlestown (Mass.) Female Seminary. She subsequently married D. P. Livermore, a Universalist clergyman (who died in 1899), and assisted him for some time in editing a Universalist paper in Chicago. She took an active part in the antislavery and temperance movements, and during the Civil War distinguished herself by her labors for the soldiers, under the direction of the United States Sanitary Commission. Afterwards she became prominent as a lyceum lecturer upon moral and social questions, and took a very conspicuous part in the total-abstinence cause and in the movement to secure suffrage for woman. She was for several years one of the associate editors of the Boston *Woman's Journal* (1870-71). Her publications include: *The Children's Army* (1841); *A Mental Transformation* (1848); *Pen Pictures* (1863); *What Shall We Do With Our Daughters?* (1883); *My Story of the War* (1888); *The Story of My Life* (1897). With Frances E. Willard she edited *American Women.*

LIV'ERPOOL. The second city and seaport of England, a civic county, Parliamentary and municipal borough of Lancashire, on the right bank of the Mersey estuary, 3 miles from the Irish Sea, 31½ miles southwest of Manchester, and 201 miles northwest of London (Map: England, D 3). Seven railways enter the city, and there is a daily steamship communication with Dublin. There are four tunnels under the town in connection with the London and Northwestern Railway, and one in connection with the Midland Railway. A tunnel under the Mersey, 1230 yards long, opened in 1886, connects Liverpool with Birkenhead (q.v.). The city covers an area of 12,252 acres, and extends in a semicircular bend along the river-front, which is lined for seven miles by docks and basins, connected by an electric trolley railroad. In the centre is the great floating landing-stage. The docks constitute one of Liverpool's most striking features. The principal streets diverge from the level ground on the river bank up the adjacent slopes, which attain a maximum altitude of 250 feet. The main arteries are the Stanley and Scotland roads, while Church and Bold streets are famed for their large and handsome stores. The modern improvement of Liverpool dates from early in the nineteenth century, and its public buildings are some of the finest in the world. Saint George's Hall, built from 1838 to 1854 with the proceeds of dock profits, occupying three and one-half acres of land, is 600 feet long and 170 feet wide. It is of a Corinthian order of architecture, and its great hall, containing one of the largest organs in the world, is used for public meetings, music festivals, organ recitals, etc.; the assize courts and other public offices are in the building. Near Saint George's Hall are the Free Library and Museum, the Walker Fine Art Gallery, the Picton Lecture Hall and reference library, the Lime Street railway station, and the principal theatres. Also centrally situated are the municipal offices and the New Law Courts; other fine structures include the Town Hall, rebuilt in 1754, and forming one side of a quadrangle, with the Exchange in French Renaissance occupying the other sides; the extensive custom-house in Ionic, the post-office, Royal Institution, University College, the markets, banks, insurance buildings, hotels, and several places of amusement. Of the numerous ecclesiastical buildings, Saint Luke's, a fine modern Gothic church, occupies a prominent site, and Saint Peter's is the pro-cathedral of the diocese. Saint James's Mount is the site of the cathedral now in course of erection. There are several large and elegant squares in the east or fashionable part of the town, fine parks, and the suburbs are studded with the handsome mansions and private residences of the merchants and tradesmen of the city. Of the numerous monuments and statues in the city, the chief are those of Queen Victoria, Prince Albert, Nelson, Wellington, and Huskisson.

For administrative purposes Liverpool is divided into sixteen districts, represented in the city council by three councilors and one alderman each. Liverpool sends nine members to Parliament. To remedy the evil of overcrowding in the poorer quarters, old tenements have been condemned and either torn down by their owners or purchased by the city. The poorest among the working people live in underground cellars, which are highly injurious to health. The city now issues strict regulations as to their minimum size, height, position with regard to the ground, ventilation, light, etc., violation of such regulations being punished by fine. How serious the evil is may be seen from the fact that with an average city death-rate of about 23 per 1000 in 1896-99, the mortality in unsanitary districts during the same period ranged from 33 to 65. The death-rate in the modern artisans' dwellings built by the city was only 21. Municipal dwellings were first opened in Liverpool about 1888, accommodating 271 families and 12 shops. The city has been building ever since, the buildings differing in accommodation and size according to their location for artisans and for unskilled laborers. The former are largely three-room dwellings rented for about $6 per month, the latter one and two-room dwellings at an average monthly rent of $1 per room. The corporation owns considerable real estate, a great part of which it has inherited from the mediæval municipality. Its annual net income from that property exceeds $500,000.

The water-supply has long been in the hands of the city. The old supply from Rivington becoming inadequate, the corporation under an act of Parliament acquired Lake Vyrnwy, from which it conveys the water through an aqueduct 68 miles long. The work was completed in 1872 at a cost of about $10,000,000, and the new source is capable of yielding 40,000,000 gallons a day. The cleansing of the city of the sewage and garbage is carried on by the corporation under the immediate supervision of the city engineer. The material gathered is converted as far as possible into fertilizers, the rest being disposed of by combustion. The clinker remaining after combustion is broken up and made into slabs for sidewalks. Part of the sewage is conveyed to the municipal sewage farms, on which are raised crops of rye, grass, and all kinds of vegetables. These farms have been thus remuneratively managed for over twenty-five years. The maintenance of municipal baths dates as far back as 1794, Liverpool having been the first city in England to provide its citizens with cheap bathing facilities. It has at present the largest and best-fitted bathing establishments in England, which are patronized by more than a million people per year, but with the extremely low prices (one cent upward) the city has not been able to make them self-sustaining. The municipal markets, however, more than offset the above losses, yielding on the average an annual net income of some $90,000.

The entire system of docks and harbor improvements of the city is in the hands of the Mersey Dock and Harbor Board, in which are represented the three boroughs Liverpool, Birkenhead, and Bootle. The first Mersey dock was built by the Liverpool corporation in 1708. Several of the docks are inclosed with large warehouses and most of them have half-tide locks and wet basins. The Herculaneum dock contains a remarkable petroleum magazine made of solid rock and having a capacity of 60,000 barrels. Liverpool is one of the half-dozen large English cities having no municipal gas plant. But it acquired an electric plant in 1895, which has been enlarged since to provide power for the municipal tramways. The latter have been worked by the city only since 1897; previous to that the lines were leased to a private company at an annual rental which left the city a net profit of nearly $100,000. Liverpool owns and maintains five hospitals for the treatment of infectious diseases such as smallpox, diphtheria, and typhoid. More than $3,000,000 has been expended by the corporation for parks, and in addition to its nine large parks there are more than twenty small gardens, bringing the total park area up to more than 700 acres.

In addition to its public schools, the city subsidizes a great number of institutions to provide facilities for technical instruction; there are special centres of instruction for working women and girls; evening classes in commercial and technical subjects; a school of applied art; and departments of electrical engineering, hygiene, and commerce in connection with the University College. Also notable are the Liverpool College, Liverpool Institute, School of Art, School of Architecture and Applied Science, Saint Francis Xavier's College, Catholic Institute, and the Liverpool School of Science. The corporation has recently established a nautical college for the training of officers and seamen for the merchant marine. The city maintains free public libraries, which are well equipped and accessible to the people in every section of the town. Free lectures for working people are given in connection with that department. The museums include the Derby Museum, with zoölogical, botanical, and geological departments and an aquarium; and the Mayer Museum, containing European and Oriental antiquities and an ethnographical collection.

Liverpool is known more for its commerce and shipping than for its industries. Its foreign trade has given it its great importance. It has the largest share of the British trade with America, Australia, India, Africa, and the Mediterranean Sea, and until very recently stood at the head of British commercial ports, but of late years has been outstripped by London. Its growth will be seen from the following table:

YEAR	Vessels	Tonnage
1801	5,060	459,719
1831	12,537	1,522,436
1861	21,095	4,977,272
1881	20,249	7,898,948
1901	20,087	12,000,000

Liverpool has a larger fleet of merchant vessels than any other seaport in the world. The leading articles of import are cotton (85 per cent. of all the cotton imports into the country), flour and grain, cattle, dressed meat, raw sugar, wool, tobacco, timber, leather, etc.; the combined value of imports reached the enormous total of over $500,000,000 in 1901. The chief articles of export are cotton goods, linen, machinery, pig iron, etc. As an industrial centre Liverpool is famous for its shipbuilding yards, in which large merchant and war vessels are made. It has also large iron and brass foundries, engine-works, sugar-refineries, breweries, etc. It is a great shipping point of emigrants to America.

The growth of Liverpool in population has kept pace with its commercial progress. In the middle of the fourteenth century there were only about 800 inhabitants. In 1700 the population was nearly 6000; in 1760, about 25,000; in 1801, 82,000; in 1851, 375,000; in 1891, 629,548; in 1901, 684,947.

The name Liverpool, probably Anglo-Saxon in origin, first occurs in 1190. In 1207 King John granted certain privileges to all settlers in the place, and in 1229 it received a charter of incorporation. Before 1600 its growth was insignificant. During the Civil War it was held by the Parliamentarians; was thrice besieged, and was taken by Prince Rupert in 1644. Its commercial prosperity began after the Restoration. During the eighteenth century it grew rich in the slave trade and privateering; later it became the great emporium for American trade. The first important steam railroad in the world was opened between Liverpool and Manchester in 1830.

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LIVERPOOL. The capital of Queen's County, Nova Scotia, Canada, a town and port of entry on the Mersey River, 75 miles southwest of Halifax (Map: Nova Scotia, E 5). A free bridge connects the town with Bristol. It contains the county buildings, has a good harbor, considerable ship-building, and shipping trade. It has tanneries, leather manufactures, saw and planing mills, and carriage-works. The United States is represented by a consular agent. Population, in 1891, 2405; in 1901, 1937.

LIVERPOOL, Charles Jenkinson, first Earl of (1727-1808). An English statesman. He was born at Winchester, April 26, 1727, and came of a distinguished Oxfordshire family. He was educated at the Charterhouse School, London, and at University College, Oxford, graduating M.A. in 1752. In early life he published, among other works, a *Discourse on the Conduct of Government Respecting Neutral Nations*—a valuable work, which was translated into several languages. His literary ability attracted the notice of Lord Bute, whose private secretary he became. In 1761 he was appointed an Under-Secretary of State, and the same year was elected to Parliament; in 1763 he became joint Secretary of the Treasury; in 1766 was made Lord of the Admiralty by the Grafton Administration; in 1772 was appointed one of the vice-treasurers of Ireland, and in 1776 Master of the Mint. He was Secretary of War, 1778-82, and his connection with the closing years of the American War gained him an unpopularity on both sides of the Atlantic, which, however, he outlived. In 1783 he was appointed by Pitt a member of the Board of Trade. In 1786 he was made Chancellor of the Duchy of Lancaster, created Baron Hawkesbury, and appointed president of the Board of Trade; in 1796 he was created Earl of Liverpool. After this he withdrew almost entirely from public life, and died in London, December 17, 1808.

LIVERPOOL, Robert Banks Jenkinson, second Earl of (1770-1828). An English statesman. He was the eldest son of Charles Jenkinson. Educated at the Charterhouse School and Christ Church College, Oxford, he went in 1789 on a Continental tour, which gave him a sight of the opening days of the French Revolution. In 1790 he was elected to Parliament, and became closely connected with the Tory interests. After seven years' work as a member of the India Board, he became a member of the Addington Cabinet in 1801, negotiating while in that position the famous Treaty of Amiens with Napoleon. After 1796 he was known by courtesy as Lord Hawkesbury, and in 1803 was created Baron Hawkesbury. On the return of Pitt to power, Hawkesbury became Home Secretary (1804-06). He held the same office under the Portland Administration, in 1807. In 1808, on the death of his father, he became Earl of Liverpool. After holding portfolios in the Ministry of Perceval, he became Premier on the assassination of that statesman in 1812, and for fifteen years remained at the head of English affairs. Though his administration was frequently very unpopular, he was enabled, by the union in 1812 of the old and new Tories, to obtain majorities. He opposed the reform of Parliament and Roman Catholic emancipation, and had to bear the odium of the difficulties of George IV. with his wife, Queen Caroline. His Ministry was further criticised for the bad administration of finances, the increase of the duty on imported grain, and the reputed connivance of England in the putting down of the revolution in Naples. Personally Lord Liverpool was a free-trader, seeking, in connection with Canning and Huskisson, the reform of the burdensome Corn Laws. On February 17, 1827, he had a stroke of paralysis, and was compelled thereby to resign office. He died December 4, 1828. Liverpool was not a brilliant man, but his conservatism and steadiness helped materially to carry England safely through the enormous difficulties of the Napoleonic era, and the rearrangement of affairs which became necessary thereafter. Consult: Yonge, *Life and Administration of Lord Liverpool* (London, 1868); Kebbell, *History of Toryism* (London, 1882); Napier, *Peninsular War* (London, 1857).

LIVER-ROT, or Fluke Disease. A disease of sheep, due to the presence, in the liver and biliary ducts, of a fat worm (*Distoma hepaticum*) or fluke, which often causes very heavy losses in sheep-raising countries. It also occasionally attacks rabbits, hares, deer, and cattle. Autumn and early winter are the periods of its most frequent occurrence. Close, damp weather, inducing a rapid growth of soft, luxuriant herbage, favors its development; low, damp, marshy situations, water-meadows, and undrained lands furnish a large proportion of cases, and sheep grazed upon such land, or taking a single draught from an infected, stagnant pool, may contract the disorder by swallowing the young flukes. The hay from such localities induces rot almost as readily as the fresh grass. From fifteen to forty days usually elapse before any serious consequences follow from the presence of the parasite. At first, indeed, digestion appears to be stimulated, and the sheep thrive rather better than before; but by and by they rapidly waste, their wool becomes dry and easily detached, their bowels irregular, their skin and mucous membranes yellow, as is usually conveniently observed by examining the eye and its pearly caruncle. The body, after death, is soft, flaccid, and indifferently nourished; watery effusions are discovered underneath the jaws and in other dependent parts; the small quantities of unabsorbed fat are dirty yellow; the liver is soft and enlarged, and usually mottled with patches of congestion. In the thick and muddy bile, the flukes, with their myriads of spawn, float in variable numbers.

The treatment of liver-rot is so seldom satisfactory that if the animals, when first affected, are in tolerable condition, no time should be lost in having them slaughtered. If remedial measures are attempted, the sheep should be removed to a dry situation, and liberally supplied with dry, nutritive food. During the summer, feed grain with the grass; during the winter, when cases are most frequent, supply clover-hay, peas, or split beans, a little bruised linseed cake, and a few roots; pieces of rock salt should also be laid about the ground for the patients to lick. Medicines are seldom of much avail. Those most to be relied on are turpentine and powdered gentian in two-dram doses, given daily, beaten up with an egg and a little milk, or with some linseed gruel. The turpentine, besides acting beneficially as a stimulant, doubtless also exercises a poisonous action on the flukes, while the gentian imparts tone to the irritated and relaxed bowels. The prevention of liver-rot is usually effected by removing from the land all superfluous moisture by deep and thorough drainage. Where pastures are suspected of infestation, beans and oats should for a time be fed in moderate quantity, and access allowed to rock salt. The reason for avoiding inundated or marshy localities is that the immature form of the liver-fluke, after passing its preliminary stages in the bodies of water-snails, attaches itself to grass and other plants in such places, and thus gains entrance to the sheep along with the forage. See Fluke; Trematoda.

LIVERSEDGE, lĭv′ẽr-sĕj. A town in the West Riding of Yorkshire, England, six miles southeast of Halifax (Map: England, E 3), and one mile west of Heckmondsville. Its importance is due to its manufactures of iron, mill machinery, woolen, cotton, and other goods. Population, in 1891, 13,670; in 1901, 14,000.

LIV′ERSIDGE, Archibald (1847—). A British chemist and mineralogist, born at Turnham Green. He studied at the Royal School of Mines and the Royal College of Chemistry, and at Christ's College, Cambridge, and on finishing his course there was made university demonstrator in chemistry in 1870. Later he went to Australia, where he was appointed professor of chemistry and dean of the faculty of science in the University of Sydney, New South Wales. His publications include *The Minerals of New South Wales* and a *Report Upon Technical Education and Museums.*

LIVERWORT. One of the bryophites (q.v.). See Hepaticæ.

LIVERY (AF. *liverie, liveree,* OF. *liveree, livree,* Fr. *livrée,* from ML. *liberata,* delivery, from Lat. *liberare,* to deliver, set free, from *liber,* free). A word applied in its origin to the custom which prevailed under Carolingian kings of delivering splendid habits to the members of their households on great festivals. In the days of chivalry the wearing of livery was not, as now, confined to the domestic servants. The duke's son as page to the prince wore the prince's livery, the earl's son bore the duke's colors and badge, the son of the esquire wore the livery of the knight, and the son of the gentleman that of the esquire. Cavaliers wore the livery of their mistresses. There was also a large class of armed retainers in livery attached to many of the more powerful nobles. In England this custom became such a menace to strong government that in 1390 the statute of Livery and Maintenance was passed, forbidding any one save the King to give a suit of livery. The law, however, was evaded, and the evil continued until the time of the Tudors. The livery colors of a family are taken from their armorial bearings, being generally the tincture of the field and that of the principal charge; or, where the field has two tinctures, both are taken. The royal family of England have sometimes adopted colors varying from the tinctures of the arms. The Plantagenets had scarlet and white; the House of York, murrey and blue; white and blue were adopted by the House of Lancaster; white and green by the Tudors; yellow and red by the Stuarts and by William III.; and scarlet and blue by the House of Hanover. An indispensable part of the livery in former times was the badge (q.v.).

The freemen of the different trade guilds of London are called liverymen, entitled to wear the livery of their respective companies, and the companies pride themselves on the splendid appearance which their liveries make in the civic train.

LIVERY COMPANIES. See Guild; Livery.

LIVERY OF SEISIN (delivery of possession). In English law, the method by which the feoffment, or ceremonial conveyance of land, was effected. It was anciently requisite in all conveyances of freehold estates, as these, being founded on an actual seisin, could not be transferred otherwise than by a transfer of the seisin. In its original and characteristic form it was an open and notorious transaction, occurring on the land, the seller, in the presence of witnesses, handing to the buyer a twig or a clod of earth, in token of the land to be conveyed. This was known as a 'livery in deed.' When it was not feasible to go upon the land, the same ceremony might be performed at a convenient place in view of the premises to be conveyed. Such livery, known as 'livery in law,' was equally valid as that performed on the land itself, but the feoffment or conveyance in that case was not complete unless the vendee entered upon the premises within the lifetime of the vendor. As livery was concerned with the transfer of the seisin, it had to do only with real property described as corporeal and not with incorporeal interests, such as easements, remainders, and the like. Livery of seisin no longer exists as a method of conveying real property, having everywhere been superseded by deeds of conveyance. See Conveyance; Deed; Delivery; Feoffment; Seisin.

LIV′IA DRUSIL′LA (B.C. 56-A.D. 29). The wife of the Roman Emperor Augustus. She was the daughter of L. Livius Drusus Claudianus. She was married to Ti. Claudius Nero, by whom she had two sons, Tiberius (afterwards Emperor) and Nero Drusus. But before the birth of the latter Augustus fell in love with her, divorced his own wife, Scribonia, and compelled Livia's husband to divorce her, and married her in B.C. 38. She was in many ways a remarkable woman, and her influence over the Emperor was great. She possessed strength of character and consummate tact, and strove to please the Emperor in every way. The only source of discord was the question of succession to the throne, for Livia was ambitious for her son Tiberius, and her intrigues in his behalf rendered the later years of Augustus unhappy. Scandal attached to her name, and the suspicion was roused that the death of the Emperor's grandsons, Gaius and Lucius, the logical heirs, was brought about by the contrivance of Livia. Augustus, left without male descendants, was forced to adopt Tiberius in his will. He died in A.D. 14, leaving the request that Livia be adopted into his *gens* and called Julia. Tiberius now became Emperor, but Livia continued to act as his guardian even in State matters, being unwilling to lose the power and influence she had gained. This proved excessively distasteful to Tiberius, who conceived a growing dislike for her, and when she died at an advanced age in A.D. 29, made no concealment of his satisfaction at her death.

LIVII, lĭv′ĭ-ī. A Roman family of plebeian rank but great influence and power. The earliest consul from the *gens Livia* was Marcus Livius Denter, consul in B.C. 302. The later history of the family is closely bound up with the history of the Empire. (See Livia Drusilla and Drusus.)

The cognomina of the gens are Denter, Drusus, Libo, Macatus, and Salinator. The last of these was first given to MARCUS LIVIUS, who imposed a tax on salt in his censorship. As consul with Æmilius Paulus in B.C. 219 he shared in the triumph after the Illyrian War, but was condemned for having unfairly divided the spoils. But he was consul again in 207, and in that year commanded, jointly with the Consul Gaius Claudius Nero, the army which defeated Hasdrubal at the Metaurus. In 205 he was proconsul in Etruria, and penned up the Carthaginian Mago in Liguria; he was censor in the following year, with Nero, his old enemy and colleague, in the consulate, and the two quarreled bitterly. A LIVIUS DRUSUS in B.C. 54 was defended by Cicero from the charge of betraying a case he was to prosecute, and was acquitted. He may possibly have been the Livius Drusus Claudianus, father of Livia Drusilla and originally of the Claudian gens, who sided with the liberators and committed suicide after Philippi (B.C. 42).

LIVING FISH. A name in China, translating 'lang ya,' for various walking fishes (q.v.), so called because they are "carried about in tubs and sold in pieces cut from the fish when alive."

LIV'INGSTON. A seaport of Guatemala, situated at the mouth of the Dulce, on the Gulf of Amatique. It is a port of transit for the town of Izabal (q.v.), situated at the head of Lake Izabal, of which the Dulce is the outlet, the river not being navigable for large vessels. The town exports coffee, cabinet-woods, and tropical fruits, the trade being chiefly with the United States. It is the seat of a United States consular agent. Population, 1500.

LIVINGSTON. A city and the county-seat of Park County, Mont., 123 miles southeast of Helena, on the Yellowstone River, and on the Northern Pacific Railroad and its National Park branch (Map: Montana, D 3). It is a railroad division headquarters, and, besides machine-shops, roundhouses, etc., has lumber-mills and lime-works, and an important trade in live stock, wool, gold, coal, and coke. The city is of note also as a centre for sportsmen, the adjacent region affording good hunting and fishing. The Northern Pacific Railroad depot here, erected in 1902, at a cost of $75,000, is a splendid edifice. Population, in 1890, 2850; in 1900, 2778.

LIVINGSTON, EDWARD (1764-1836). An American jurist and statesman, born May 26, 1764, at Clermont, Columbia County, N. Y. He graduated in 1781 at Princeton, studied law at Albany and New York, was admitted to the bar in 1785, and rose rapidly to high rank in his profession. From 1795 to 1801 he was a member of Congress, where he supported the measures of the Republican Party, and attracted attention, particularly by speeches against the Alien and Sedition laws, on the resolution calling for the correspondence relative to the Jay Treaty, and on the conduct of President John Adams in the case of Jonathan Robbins. In 1801 he was appointed United States Attorney for the district of New York, and during the same year was elected Mayor of the city of New York. Through the dishonesty of a clerk in the District Attorney's office, Livingston's affairs soon became seriously embarrassed, with the result that he was found to be considerably behind in his accounts. Upon discovering the conduct of his agent Livingston voluntarily confessed judgment for $100,000, resigned his office, and prepared to leave New York. The exact amount of the shortage was something over $43,000. It was not until 1826 that a final settlement with the United States was made. The amount of the shortage with the accrued interest had then reached $100,000, every dollar of which Livingston paid. His resolution to abandon the State was unshaken, and he could not be persuaded to reconsider his decision. In December, 1803, he sailed for New Orleans, and early in 1804 became a member of the bar there. Louisiana had just been acquired by the United States, chiefly through the diplomacy of his brother, Robert R. Livingston, and a great future seemed to await men of Livingston's talents in that country. The legal system of Louisiana was a strange mixture of Spanish and French law, having its foundation in the *Corpus Juris Civilis* of the Romans. In spite of this difficulty he soon had a lucrative practice, and, by accepting land for his fees, acquired the basis of a respectable fortune. During the second war with Great Britain he served for a time as secretary and confidential adviser to General Jackson. In 1820 he was elected to the Lower House of the Louisiana Legislature, and with two other members was commissioned to prepare a civil code for the State. Their draft, largely the work of Livingston, was adopted, in large part, by the Legislature in 1825. In the year 1821 he was selected by joint ballot of the Legislature to revise the entire system of criminal law of the State. For this task he possessed preeminent qualifications, having studied with great care the legal systems of Rome, France, Spain, and Great Britain. After about three years of labor he had finished a complete system of penal law, divided into codes, books, chapters, sections, and articles. Unfortunately, just as the final draft of the code was completed, it accidentally caught fire and was completely destroyed. Undaunted by this misfortune, he again began the work, and within two years it was again completed. The code was marked by liberal and enlightened principles, and contained provisions looking toward a more humane penal system. The work was styled *A System of Penal Law*, and was divided into a Code of Crimes and Punishments; a Code of Procedure; a Code of Evidence; and a Code of Reform and Prison Discipline, besides a Book of Definition. The system which Livingston prepared was never directly adopted as a whole by the State, but its publication gave him fame throughout America and Europe, and many of its principles were incorporated in the legal systems of other States of America, and even in those of certain European countries, while the Government of Guatemala adopted his Code of Reform and Prison Discipline without change. In 1822, while still engaged in the revision of the Louisiana legal system, Livingston was elected to Congress. He was twice reëlected, serving until 1829, when he was transferred to the United States Senate, where he took high rank. In 1831 President Jackson appointed him Secretary of State, and in 1833 sent him as Minister Plenipotentiary to France to demand the payment by the French Government of an indemnity of a million sterling on account of depredations upon American commerce. He was entirely successful in this mission, and returned to the United States in 1835, settling on his estate, 'Montgomery Place,' on the Hudson, where he died the following year. His works on *Criminal Jurisprudence*, in two volumes, were published in New York in 1873. Consult Hunt, *Life of Edward Livingston* (New York, 1864).

LIVINGSTON, Henry Brockholst (1757-1823). An American soldier and jurist, son of William Livingston. He was born in New York City, and graduated at Princeton in 1774. Upon the breaking out of the Revolutionary War, he entered the Patriot army, served as an aide on Benedict Arnold's staff, with the rank of major, in the operations against Burgoyne, and later received the rank of lieutenant-colonel. In 1779 he went to Spain as secretary to John Jay, his brother-in-law, and was taken prisoner on the return voyage in 1782 by the British, but was soon released. He then studied law under Peter Yates, was admitted to the bar in 1783, and quickly became prominent in his profession. In 1802 he was made a judge of the New York Supreme Court, and in 1807 associate justice of the United States Supreme Court, which latter office he held until his death. He dropped his first name about 1783, and is generally known merely as Brockholst Livingston.

LIVINGSTON, Peter Van Brugh (1710-92). An American merchant, born in Albany, N. Y., the son of Philip, second lord of Livingston Manor. He graduated at Yale in 1731, settled in New York City, where he became a wealthy merchant in partnership with his brother-in-law, William Alexander (Lord Stirling), and built a large mansion on what is now Hanover Square. He was a leading Presbyterian, and was one of the founders in 1746 of an institution at Elizabethtown, N. J., which soon after became Princeton College. For many years previous to the Revolution, he was a member of the New York Provincial Council. During the larger part of the period between 1759 and 1774 he was active in the Revolutionary cause, quietly but effectively promoting resistance to the mother country. In 1759 he was a member of the Council of Ten, and he was also a member of the Committee of One Hundred. In 1760 he joined the Sons of Liberty, and he became one of the leading spirits of that organization. On April 22, 1774, he was one of a party who, disguised as Mohawks, like their Boston compatriots, threw overboard a cargo of tea brought by the *Nancy* into the harbor of New York. He was president of the first Provincial Congress and delegate to the second. He enjoyed the friendship of Washington, and on more than one occasion was consulted by him. It was at his country place at Dobbs Ferry that General Washington, Governor Clinton, and Sir Guy Carleton met to settle matters connected with the evacuation of New York City by the British forces. After the adoption of the new State Constitution in 1777 he was elected to the Legislature, and was chosen president of the Lower House. From 1776 to 1778 he was treasurer of the Continental Congress.

LIVINGSTON, Philip (1716-78). A signer of the Declaration of Independence. He was born in Albany, N. Y., and graduated at Yale in 1737. He became a successful merchant in New York City, was a member of the City Council, served in the Colonial Assembly from 1758 to 1769, and was Speaker in 1768. He was an ardent supporter of the Patriot cause, represented New York in the Continental Congress from 1774 to 1778, and signed the Declaration of Independence. Livingston helped to found the New York Chamber of Commerce, and was a benefactor of Yale, and of King's (now Columbia) College.

LIVINGSTON, Robert (1654-1725). An American colonist, the founder of the Livingston family in America. He was born at Ancrum, Scotland, the son of John Livingston, a Scotch Presbyterian clergyman, who was banished and settled in Rotterdam, Holland, in 1663. There Robert was educated by his father, after whose death he emigrated to Charlestown, Mass., in 1673. In 1675 he removed to Albany, N. Y., where he received an appointment as secretary of commissaries, an office which he held for many years. He also served as town clerk, and as a member of the Colonial Assembly from 1711 until his death, being chosen its Speaker in 1718. He served for many years as Secretary of Indian Affairs, to which office he was first appointed by Sir Edmund Andros (q.v.). In 1686 he received a grant of land in what was later Dutchess and Columbia counties, confirmed by royal charter in 1715, and erected the manor of Livingston with privileges of court leet, court baron, and advowson.

LIVINGSTON, Robert R. (1746-1813). An American jurist and statesman, brother of Edward Livingston. He was born in the city of New York, November 27, 1746; graduated at King's (now Columbia) College in 1765, then studied law, was admitted to the bar in 1773, and for a time was associated in the practice of his profession with John Jay. In the same year in which he was admitted to the bar he was appointed by the Crown to the position of recorder of the city of New York, an office which he was compelled to relinquish two years later, on account of his sympathy with the revolutionists. In the following year he became a member of the Continental Congress, and served on the committee which was appointed to draw up the Declaration of Independence, which document, however, he did not sign, owing to his withdrawal from Congress to attend the meeting of the Provincial Convention of New York. Later in the Revolution he served another term in the Congress (1779-81). He was a member of the committee which drafted the Constitution for the State of New York in 1777, and upon its adoption became the first chancellor of the State, an office which he filled with distinction until 1801. It was in this capacity that he administered the oath of office to Washington, on the occasion of his first inauguration to the Presidency, in New York City. While serving as chancellor of New York he was appointed Secretary of the new Department of Foreign Affairs, created by Congress in 1781, a position which he held until 1783, when he was succeeded by John Jay. He was president of the New York Convention of 1788, which was called to take action with regard to the Federal Constitution, and used his influence to secure the ratification of that instrument. In 1794 President Washington tendered him the post of Minister to France, which he declined; but in 1801, upon receiving a second tender of the same office, he accepted, and began the negotiations for the purchase of Louisiana, which, after the arrival of Monroe, were carried to a successful conclusion. He was associated with Fulton in the application of steam to navigation; gave his attention to the practice of scientific agriculture, publishing an *Essay on Agriculture* (1809), and an *Essay on Sheep* (1809), introduced the merino breed of sheep into western New York, and was instrumental in introducing the use of gypsum as a fertilizer. He served on a commission to adjust the boundary of New York State, and for a time was president of the American Academy of the Fine Arts, of which he was one of the principal founders.

Consult DePeyster, *Biographical Sketch of Robert R. Livingston* (New York, 1876).

LIVINGSTON, William (1723-90). An American lawyer and patriot, Governor of New Jersey from 1776 to 1790. He was born at Albany, N. Y., the son of Philip, the second Lord of Livingston Manor. He graduated at Yale in 1741, and studied law in New York City, where he was admitted to practice in 1748, and where in a few years he became one of the leading lawyers in the city. In 1760 he purchased a large estate at Elizabethtown, N. J., where he built a mansion, which he named 'Liberty Hall.' He was known as 'the Presbyterian lawyer,' and ardently opposed the institution of Episcopal dioceses in America in the *Independent Reflector,* a weekly paper which he established in 1752. He was president of the 'Moot,' a famous law club in New York, and was a frequent contributor to the *American Whig,* and the author of numerous able pamphlets defending the rights of the Colonies. In 1772 he gave up most of his law practice and retired to his New Jersey estate. With the exception of three terms in the New York Provincial Legislature as representative of his brother Philip's manor, he had no public office until his election to the Continental Congress in 1774. At first much opposed to the idea of separation from the mother country, he became convinced at last that that was the only possible course, and championed it with enthusiasm. He was reëlected to the Second and Third Congresses, and in June, 1776, was made commander-in-chief of the New Jersey militia. In August, 1776, he was elected Governor of New Jersey, and, resigning his military command, remained in office until his death. Throughout the war his services were of the greatest value to Washington and the American cause, and he ranks as one of the most efficient of the 'war Governors' of the Revolution. He was a member of the convention which drew up the Constitution of 1787, and signed that document. With William Smith, Jr., he prepared a *Digest of the Laws of New York, 1691-1762.* Consult Theodore Sedgwick, Jr., *Life and Letters of William Livingston* (New York, 1833).

LIVINGSTONE, lĭv′ĭng-ston, David (1813-73). An African missionary and explorer, born at Blantyre in Lanarkshire, Scotland, March 19, 1813. At the age of ten he began work in a cotton factory, and spent some ten years as an operator, educating himself by private study and attending an evening school. In this manner he gained some knowledge of Latin and Greek, and finally, after pursuing a course in medicine at Anderson College, Glasgow, and listening to the theological lectures of Dr. Wardlaw, professor of theology to the Scotch Independents, he offered his services to the London Missionary Society, by whom he was ordained as a medical missionary in 1840, and sent to South Africa, where he commenced his labors among the natives of Bechuanaland and the vast regions to the north. He secured the friendship and coöperation of the native chiefs, planted posts far beyond the civilized frontier, and systematically studied the languages and customs of the natives in order to establish a method of utilizing their efforts for their own civilization. In 1849 he pushed northward far beyond the Tropic of Capricorn, and on August 1st discovered Lake Ngami. In 1852 he set out on a fresh expedition which brought him to the Zambezi, a river at that time barely known to Europeans. He explored the upper course of the stream, thence struck out westward, and in 1854 reached Loanda on the Atlantic Ocean. He then made his way back to the Zambezi, and achieved the traverse of the continent by following that stream to its mouth in the Indian Ocean, which he reached in 1856. On this journey he discovered the Victoria Falls, the grandest cataract in the Old World. From Quilimane he sailed, in the beginning of 1856, for England, where he was overwhelmed with honors. In 1857 Livingstone published his *Missionary Travels and Researches in South Africa.* In the same year he severed his connection with the London Missionary Society, and in 1858 was appointed British Consul at Quilimane for the East Coast of Africa, and also commander of an expedition to explore Eastern and Central Africa. He ascended the Shire, the lowermost of the large affluents of the Zambezi, and discovered Lake Shirwa and Lake Nyassa (September 16, 1859). A narrative of the discoveries, *The Zambesi and Its Tributaries,* was published during a visit paid to England in 1864-65. In the latter part of 1865 Livingstone returned to Africa to organize an expedition to discover the true source of the Nile. Early in 1866 he started for the interior by way of the Rovuma, and nothing was heard of him for two years. Livingstone's problem was, then, to determine whether the Zambezi joined the Nile or was a tributary of the Congo. At the beginning of 1867 he came to the Chambesi, a stream traversing in a southwesterly direction the region south of Lake Tanganyika, the end of which great body of water he reached in April, 1867. In his endeavors to penetrate farther into the continent he was continually thwarted by inundations, by the hostility of the slave-dealers —both native and Arab—and by the want of supplies, which were constantly delayed and plundered. He nevertheless pressed on, discovered the Luapula (1867), and Lakes Mweru and Bangweolo. He arrived at Ujiji on Lake Tanganyika in 1869, where he remained for some time before setting out on an extended exploration of the region to the west of the northern part of that lake. In 1871 he stood on the shores of the Congo at Nyangwe, but his previous explorations had not covered the ground sufficiently to admit of his being assured that the stream before him must be the Congo. Returning to Ujiji amid great privations and sufferings, he was (November 10, 1871) met by a relief party, under H. M. Stanley, sent out by James Gordon Bennett, of the New York *Herald.* Livingstone renewed his stock of medicines and supplies, and, after exploring the northern end of Lake Tanganyika with Stanley, he parted from him in March, 1872, and proceeded to continue his explorations in the Luapula-Lualaba basin, hoping to solve the Nile-Congo problem. The great explorer was exhausted by continued hardship and privation, and died on May 1, 1873, at the village of Tshitambo, a friendly chief, on the shore of Lake Bangweolo. His native followers cut out his heart and buried it at the foot of the tree beneath whose branches he died, cutting a rough inscription on the trunk to mark the spot. In 1898 Mr. Sharpe, the British administrator for this district, visited the spot and observed that the tree was rapidly decaying. He raised a subscription in England and procured a substantial stone monument, which now marks the spot. The section of the tree containing the inscription was cut out and sent to the rooms of the Royal Geographical Society in London, where it is preserved. The body was taken to England, and on April 18, 1874, was buried in Westminster Abbey.

Livingstone's work in exploration is marked by rare precision and by a breadth of observation which will forever make it a monument to the name of one of the most intrepid travelers of the nineteenth century. His activity embraced the field of the geographer, naturalist, and benefactor of mankind, and it can justly be said that his labors were the first to lift the veil from the 'Dark Continent.'

Besides the works above mentioned by Livingstone, there was published, in 1874, ***The Last Journals of David Livingstone, from 1865 to His Death,*** edited by Horace Walter (London). For other accounts, see Stanley, *How I Found Livingstone* (London, 1872); Blaikie, *Personal Life of David Livingstone* (1882); Hughes, *David Livingstone,* in "Men of Action Series" (London, 1891); Johnston, *Livingstone and the Exploration of Central Africa* (London, 1897).

LIVINGSTONE RIVER. A name applied to the Congo River (q.v.).

LIVINGSTON MANOR. A tract of land in New York State, east of the Hudson River, and occupying the northern part of the present Dutchess County, acquired by Robert Livingston about 1674. The title was confirmed by patent by Governor Hunter in 1715, at which time the tract was computed to cover 160,240 acres. In 1752, the third proprietor, Robert Livingston, was disturbed by the encroachments of Massachusetts and complained to Governor Clinton, after which the settlement of the State boundaries secured the quiet possession of the manor until 1795. In that year efforts were made by the tenants to have the title declared invalid, and in 1844 the tenants petitioned the Legislature to set aside the grant. Both attempts were unsuccessful, but were accompanied by so much disturbance that the owners, to avoid annoyance, gradually permitted the greater part of the lands to be acquired by individual holders.

LIV'IUS AN'DRONI'CUS. The father of Roman dramatic and epic poetry. He was a Greek by birth, probably a native of Tarentum, and flourished in the second half of the third century B.C. He was made captive in one of the Roman campaigns in Southern Italy, and brought to Rome, where he became a slave of M. Livius Salinator, who afterwards freed him and gave him his name *Livius.* He learned Latin and became a teacher and author. He translated the *Odyssey* into Latin Saturnian verse, and wrote tragedies, comedies, and hymns after Greek models. Mere fragments are extant, of which a collection may be found in Düntzer's *Livii Andronici Fragmenta Collecta et Illustrata* (Berlin, 1835); Baehrens's *Fragmenta Poetarum Romanorum* (Leipzig, 1886); and Ribbeck's *Scœnicœ Romanorum Poesis Fragmenta* (Leipzig, 3d ed., 1897-98).

LIVNY, lyĕv'nĭ. The capital of a district of Livny, in the Government of Orel, Russia, situated on the Sosna, 95 miles southeast of Orel (Map: Russia, E 4). It has a *real* gymnasium, two libraries, and a municipal bank. Its chief products are leather, tallow, soap, flour, and tobacco. Grain is the principal article of trade. Livny was founded in 1586. Population, in 1897, 20,600.

LIVONIA, lĭ-vŏ'nĭ-ȧ (Ger. *Livland*). The middle one of the Baltic Provinces (q.v.) of Russia, bounded by the Government of Esthonia on the north, Saint Petersburg (between which and Livonia is Lake Peipus), Pskov, and Vitebsk on the east, Courland on the south, and the Gulf of Riga and the Baltic on the west (Map: Russia, C 3). Area, 18,800 square miles, of which the islands of Oesel, Mohn, Runö, etc., occupy 1100 square miles. The portion of Livonia west of Lake Wirzjärw along the Gulf of Riga is flat and rather low. The eastern part of the province is mainly hilly and reaches in its highest point Munna Mäggi (which also is the highest point of the Baltic Provinces), an altitude of 1060 feet. This part of Livonia is noted for its picturesqueness. It abounds in lakes and is traversed by numerous rivers, the most prominent of which are the Aa, the Düna, the Pernau, and the Embach. The climate is raw and unsteady; about one-fourth of the entire area is covered with forests. Agriculture and stock-raising are the leading industries, but the agricultural conditions in Livonia differ greatly from those prevailing in other parts of Russia. The feudal system introduced by the German conquerors practically came to an end in 1819 when the serfs of the province were emancipated by the Russian Government, but not endowed with land (as was subsequently the case in the rest of Russia), for the land was granted in perpetuity to its ex-feudal possessors. As a result of this arrangement, the larger part of the agricultural land of the province is in large estates owned by the nobility; the remainder is divided between the State, Church, and the smaller landholders. The large estates are worked by the most modern methods; excellent stock is raised on a large scale both for slaughtering and dairying; the dairy products are exported to a considerable extent. The manufactures, valued at more than $33,000,000 annually, are trimmed lumber, wagons, rubber articles, oil, paper, iron products, chemicals, porcelain ware, tobacco products, etc. The centre of industrial activity is the capital and chief port of Riga (q.v.). Population, in 1897, 1,300,640. The inhabitants are largely Letts and Esthonians. The population of the cities is made up largely of Germans, with some Russians and Jews. Over 80 per cent. are Lutherans and the rest Greek Catholics, Roman Catholics, and Jews. Dorpat (Yuriev) is the seat of a famous university. Livonia was conquered by the Teutonic Knights and the Knights Swordbearers in the thirteenth century. When the power of the

Knights Swordbearers was broken by the onslaughts of the Russians, their grand master ceded Livonia to Lithuania (q.v.). Early in the seventeenth century Gustavus Adolphus of Sweden overran and conquered the country, but it was not until 1660 that it was definitively relinquished by Poland in the Peace of Oliva. At the beginning of the eighteenth century Peter the Great of Russia wrested Livonia from Sweden, which formally renounced its possession in 1721. In recent times the Russian Government has been pursuing a relentless course of Russification in Livonia. Consult Winkelmann, *Bibliotheca Livoniæ Historica* (2d ed., Berlin, 1878).

LIVORNO, lê-vôr′nô. The Italian name for Leghorn (q.v.).

LI′VRE, *Fr. pron.* lē′vr' (OF., pound). The name of an ancient French coin. There were livres of different values, the most important being the *livre tournois* (of Tours), which was considered the standard, and the *livre parisis* (of Paris), which was equal to a livre tournois and one-fourth. In 1795 the livre was superseded by the franc (80 francs = 81 livres tournois.—Livre was also the ancient unit of weight, and was equal to 17.267 oz. avoirdupois; the kilogram (see Metric System) has taken its place.

LIVS, or **LIVO′NIANS.** A Finnish tribe, formerly living in Esthonia and North Livonia, now nearly extinct, holding only a narrow strip of forest land along the Baltic at the north point of Courland. They were supplanted by the Letts (q.v.). They are classed with the Baltic Finns and number 2000. Their language has nearly disappeared, and the people speak a Lettish patois.

LIVY, lĭv′ĭ (B.C. 59-A.D. 17). The great Roman historian, Titus Livius, is without a history, for we have no ancient biography of him, and very little information is obtained either from his own writings or from allusions in other authors. He was born at Patavium (Padua), the chief city of Venetia, in B.C. 59 (a date given in Saint Jerome's *Chronicle of Eusebius*), consequently at the beginning of the most important period of Roman history, for Cæsar had just obtained the government of Gaul. The place and period of his birth had great influence upon his career. Padua was a city of considerable importance, with a traditional history going back to Antenor, and Livy, a Paduan at heart, felt deep sympathy with the municipalities which preserved the old independent spirit of Italy; nevertheless he was in a larger sense a Roman, and recognized the advantage of association with a people who had conquered the early enemies of his native town, and who were his fellow-citizens, the Paduans having long possessed the Roman franchise. On the evidence of some inscriptions (*Corpus Inscriptionum Latinarum,* v. 2865, 2975) and of the general aristocratic spirit of his writings there is reason to believe that he belonged to a noble family. He undoubtedly received training in philosophy, rhetoric, and literature.

When Cæsar was slain and Cicero gave voice to his Philippics, Livy was fifteen years of age. He was familiar, then, with the great struggle for liberty, and with all the events of that stirring time, and in consequence was a republican. He came to Rome about B.C. 31, the year of the battle of Actium, and there he resided until shortly before his death. Although he formed a friendship with Augustus (whom, however, he mentions only twice, once to give a date and once to prove a fact), he admired Brutus and Cassius, nevertheless, and dared to say that it was a question whether or not Cæsar had been of service to his country. Augustus called him a Pompeian, perhaps in a spirit of pleasantry, as the purpose and aim of the historian must have been satisfactory to him; for while Livy idealized the Republic, he was entirely satisfied with the existing Imperial Government.

Suetonius (*Claudius* 41) remarks that Livy advised the future Emperor Claudius to write history, and that Caligula (*Caligula* 34) charged him with being negligent. This accusation was undoubtedly due to his evident ignorance of military detail and of Roman law, which resulted in errors in his description of wars and of constitutional changes. He, however, had a great reputation in his own day, of which he himself was cognizant; for he is said to have declared that he had obtained sufficient glory, but continued writing because he should miss the employment. After the accession of Tiberius Livy returned to Padua, where he died in A.D. 17. In the letters of Seneca (100, 9) there is a reference to Livy's writing dialogues, half philosophical and half rhetorical, and Quintilian (x. 1, 39) and Seneca the Elder mention a letter addressed to his son, in which he urged him to study the speeches of Demosthenes and Cicero; but these have disappeared. His history of Rome was begun early in his life, for in book i. 19 we have a reference to the fact that the temple of Janus had been shut twice since the time of Numa—once after the First Punic War, and again after the battle of Actium; the third closing occurred in B.C. 25, so that the writing of the first book must fall between B.C. 29 and 25, and as Livy also uses here the title Augustus, which was conferred in January B.C. 27, we may place the date about B.C. 26. There is also evidence that the work did not appear as a whole, but in sections, which contained a varying number of books. Certain passages are clearly prefaces to new parts of the history, e.g. at the beginning of books 6, 21, and 31. It is noticeable that book 5 ends with the burning of Rome by the Gauls, so that book 6 begins a new epoch; also book 15 begins the First Punic War, and book 21 the Second Punic War. These facts point to a publication of decades or semi-decades, but it is doubtful if Livy held to this arrangement, for in the best MSS. we find that books 109-116 are treated in one periocha, or summary, under the title *Bellum Civile.*

The division into decades is first mentioned about the close of the fifth century, and is probably the work of copyists. The entire work consisted of 142 books, of which 35 are extant, the first (to B.C. 293), third, fourth, and half of the fifth decade (B.C. 218-217). We have a few fragments obtained from such writers as Servius, Valerius Maximus, and Saint Augustine, and a page or so from book 91, preserved in a Vatican palimpsest. We have also from some unknown author epitomes, *periochæ* or *argumenta,* of all the books except 136 and 137. The epitomes show that the last year recorded was B.C. 9, and this seems to indicate that Livy did not finish his history, as the event of that year, the death of Drusus, was not of sufficient importance to form the conclusion of a great work, and there is some probability that the entire work would have contained 150 books and recorded events up to A.D. 14, the date of the death of Augustus. The title of the work was probably *Ab Urbe Condita Libri*, as this is given in the best MSS. and by the grammarians, but it is true that Livy began with Æneas, and also that he speaks loosely of his *annales* (43, 13, 2). In his preface, however, he declares that he wrote from the beginning of the city, and Pliny, in his preface to the *Natural History*, repeats this statement. Again, the term *annales* is general in its application, and, if Livy had used it as a title, Servius, who discussed the word in its relation to *historiæ*, would have referred to the fact.

To appreciate Livy's greatness we must consider the character of the writings of his predecessors in this field, for, with the exception of Sallust, Roman historians before Livy were narrators of facts and recorders of events, mere annalists. Livy, following the methods of his predecessors, built upon the foundation laid by them, and used with entire freedom, and evidently without a suspicion of plagiarism, the work of earlier historians. He relied upon the great Greek historian Polybius, and, judging from the fragments of the latter's account of the Macedonian wars, Livy took his information directly, omitting Greek references and polemical notes, and supplementing what could not be readily understood by the Romans. In the account of the Second Punic War he probably used Polybius, although Cælius Antipater was his leading authority for this period. Livy speaks very coldly of Polybius, and in fact not at all until book 30, although he had used his work through the third decade. He relied upon Valerius Antias in the first decade, but later on condemned him for his exaggerations and unreliability. Livy also used many other writers, such as Quadrigarius, Calpurnius Piso, and Silenus, a Greek who wrote in a pro-Carthaginian spirit.

When Livy's authorities disagreed, he did not endeavor to discover the truth, but followed his own fancy or struck an average. Sometimes he stands for the majority, or for the earliest and most probable account, or, influenced by his sympathies, recognizes the pro-Roman or most picturesque or impressive views, aiming all the time at the effective story. His history is not of value, then, as a critical work, falling below that of Polybius in this respect; but when we consider his patriotism and the charm of his style, we can understand Niebuhr's declaration that his history is a 'colossal masterpiece.' He was the national historian just as Vergil was the national poet. Livy accomplished the purpose of a great historian, although he was not an investigator, a quality, however, which Taine has declared to be requisite for an historian. In his celebrated preface he makes clear that he purposes to tell the story of the Roman people, and to tell it more effectively than it had been told before. desiring to impress his readers with the lessons to be drawn from the history of Rome in its progress to its culmination, and to draw his own eyes away from the evils of his time. He declares that what happened before the foundation of the city is more like a fable, and yet he would neither indorse nor condemn it. Thus Livy may not have believed in Æneas or Romulus or Numa, but he did not think it his part to examine into the matter critically, for he intended to write not a critical but an ethical history of Rome. It is in his style that Livy stands preëminent. Although the great prose writer of the Augustan age, he does not follow the rhetorical style of Cicero, but, influenced by the diction of Vergil, he invented a new style, based on that of Cicero, but expanded and made mobile by the use of poetic words and phrases. He may be termed the first writer of Silver Latinity. It may be that this peculiarity in language and style brought upon him the charge of *Patavinitas*—from *Patavium* (Padua), Livy's birthplace—made by Asinius Pollio, and mentioned by Quintilian, 1, 5, 56, and 8, 1, 3, who, however, does not make clear what this charge implied. It may refer to his general style or to his use of provincialisms or to his free and enthusiastic way of speaking, at variance perhaps with the dignified restraint of Rome. Consult: Wiedmann, *De Patavinitate Livii* (Görlitz, 1848-54); Moritz Haupt, *Opuscula*, ii. 69.

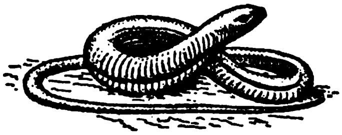
In his early books he shows the influence of the subject-matter upon his style, but when he reaches the account of the Second Punic War, and gives a description, for example, of the visit of the Roman embassy to Carthage, and when he describes the Macedonian wars, he writes in a most brilliant and masterly way. His speeches are, perhaps, artistically the most perfect of anything he has written. They are given with no intention of reproducing the words of the speaker, but reflect the character of the individual, and describe his position and motives.

BIBLIOGRAPHY. The *editio princeps* of Livy appeared at Rome in 1469, but books 33 and 40-45 are omitted. The first critical edition is that of Gronovius (Leyden, 1645). Some of the great editions are by Drakenborch (7 vols., Amsterdam, 1738-46), edited by Bekker and Raschig (Berlin, 1829); by Madvig and Ussing (Copenhagen, 1861 et seq. and 1886 et seq.), a critical edition; by Luchs, a fine critical edition of books 26-30 (Berlin, 1879), and of books 21-25 (Berlin, 1888). The most important modern edition, with notes, is that by Weissenborn and Müller (Berlin, 1867-88). There are a number of good editions of separate portions. Book 1 by Seeley (Oxford, 1876); 2 and 3 by Stephenson (London, 1886); 4 by Stephenson (London, 1890); 5 by Whibley (London, 1890), and by Prenderville (London, 1890, first edition); 5-7 by Cluer and Matheson (London, 1881); 7 and 8 by Luterbacher (Leipzig, 1889-90); 21-22 by Lord (Boston, 1891); 1, 21, and 22 by Westcott (Boston, 1891); 21-25 by A. Harcourt (Paris, 1886); 26-30 by Riemann (Paris, 1889); 1, 21, 22, Greenough and Peck (Boston, 1900). On the language, consult Riemann, *Etudes sur la langue et la grammaire de Tite Live* (Paris, 1884). A lexicon is in course of preparation by Fügner, beginning 1894.

Translations.—The entire work is translated into Elizabethan English by Philemon Holland (London, 1600); books 21-25 are translated by Church and Brodribb (2d ed., London, 1890); the entire work is translated into German by Klaiber and Teuffel (2d ed. Stuttgart, 1854-56).

LIXIVIATION (from Lat. *lixivium*, lye, from *lix*, ashes, lye). The extraction of the soluble ingredients of solid substances by allowing water to percolate through them. Lixiviation forms part of the treatment to which certain metallic ores are subjected industrially. A well-known use of lixiviation is the separation of the carbonates of sodium and potassium from the ashes of wood.

LIZARD (OF. *lezard, lisard*, Fr. *lézard*, Sp., Port. *lagarto*, It. *lacerta*, lizard, from Lat. *lacertus, lacerta*, lizard). A reptile of the order Lacertilia or Autosauria, characterized structurally by the fact that the halves of the lower jaws are connected by symphysis, that is, fused solidly together in front, while those of serpents are connected by an elastic band; and by the fact that the teeth are fixed. The vertebræ are procœlous (except in most of the geckos), and have 'intercentra,' especially in the tail. The caudal vertebræ of most forms have a transverse septum of cartilage, forming a line of weakness—the point where the tail breaks off, as frequently happens. The ribs of the trunk articulate by their capitula only, the reduced tubercula being connected with the vertebræ by ligaments. In some groups the post-sternal ribs meet in the median abdominal line, forming bony loops; in the flying dragons, the ribs support wing-like expansion. Most lizards are provided with fully developed limbs and five-toed feet; but the feet are modified in the chameleons (q.v.), and in some degraded forms, as the glass-snake and especially the amphisbæna (q.v.), which burrow, the limbs have been lost not only externally but in some cases the pelvic and pectoral girdles have completely disappeared, accompanied by an elongation of the body, so that these lizards are serpent-like in form and manners. The skull is modified principally in the composition of the temporal arches; the quadrate bone is movable except in the degraded families. The hyoid apparatus, extended into the tongue, is always present and well developed. In the Old World lizards the teeth are planted along the top of the ridge of the jaw (acrodont), while in the New World species they are fastened to the inner side of the ridge (pleurodont). In one American genus (Teius), the teeth of the young are pleurodont, but in the adult they become acrodont. The tongue is variously developed, but is always furnished with many tactile or with gustatory corpuscles. When the tongue is very long and narrow, it is generally forked, and in such cases, for example in the monitors, it is used almost entirely as a sensory organ. In most lizards it assists in catching the food, and in some families is an elaborate instrument. Salivary glands are wholly labial, and in a single genus (Heloderma) become poison-sacs. The digestive organs present little peculiarity, except in the cloaca, which is much modified in correlation with the strange copulatory apparatus, consisting of paired organs external to the cloaca, each a tube of erectile tissue, which can be everted like the finger of a glove. When at rest and withdrawn, the organs form slight conical longitudinal swellings on either side of the root of the tail. Only one organ is inserted at a time. Most lizards lay eggs, in some cases having a hard shell, but more often a parchment-like covering. The embryos are usually much advanced before the extrusion of the egg, and some species, as the American horned toads, are practically viviparous. The embryos within the hard-shelled eggs have an 'egg-tooth' or hard point upon the end of the snout, to assist them in breaking out. Certain mysterious organs beneath the ventral skin, largely composed of fat, and hence called 'fat-bodies' (consult Butler, *Proceedings of the Zoölogical Society of London*, 1889), seem to be related to the sexual functions. Lizards (except degraded subterraneous forms) have good ears and eyes, the latter with movable eyelids (except in geckos) and a nictitating membrane; but desert-dwelling and other unusual forms have special adaptations elsewhere spoken of, e.g. under CHAMELEON. Binocular vision, of course, does not occur here, any more than in other animals whose eyes look sidewise.

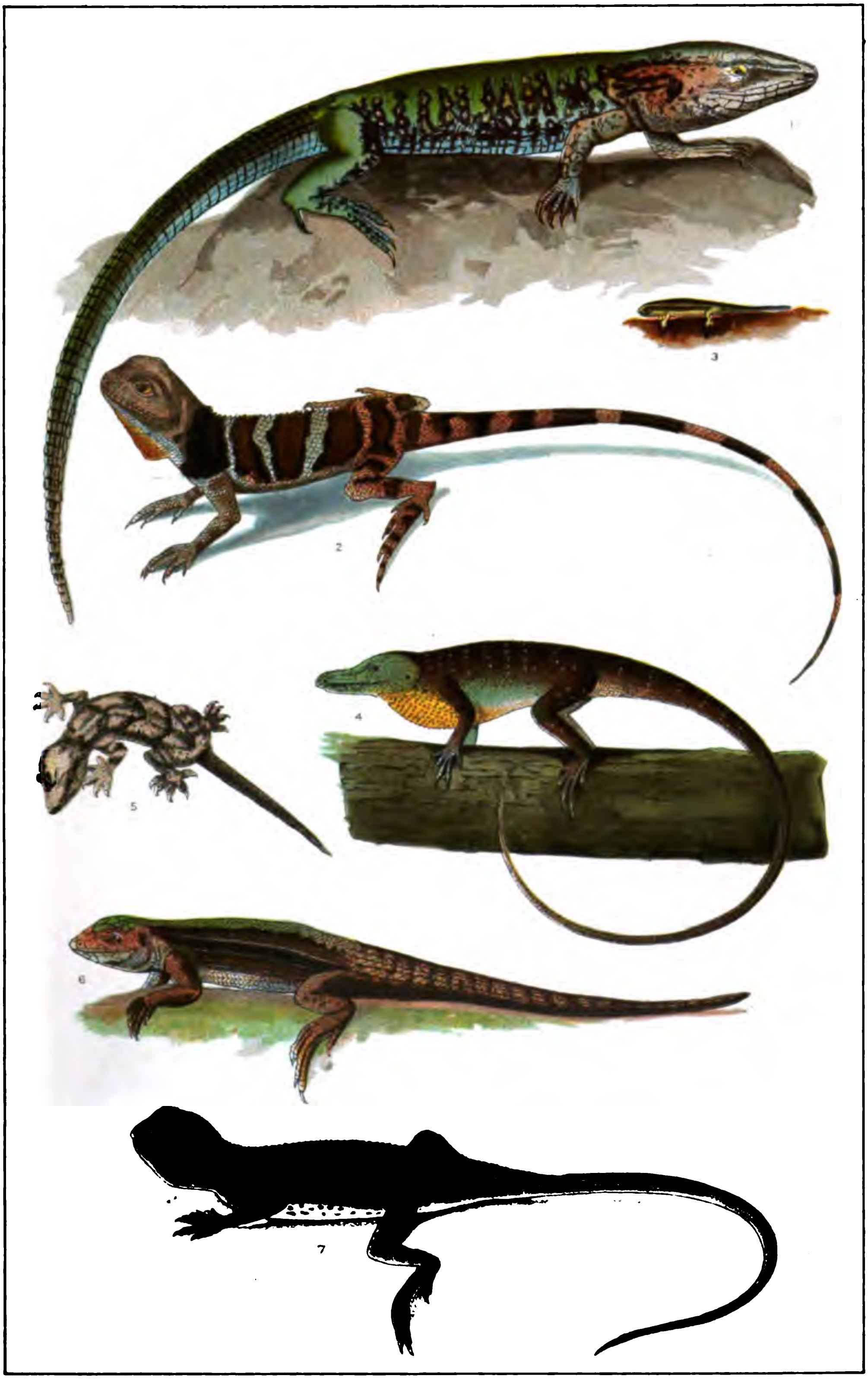


GLASS-SNAKE LIZARD.

Externally, lizards assume a great variety of shapes, from the toad-like proportions of the moloch to the vermiform aspect of an amphisbæna; but usually the head is shapely, the neck apparent, and the tail long and distinct. The tail, indeed, is of much importance in many cases as a whip-like weapon, or as a means of safety by the ease with which it breaks off when seized, thereby giving the animal a chance to escape. By some species it is voluntarily thrown off in such an emergency, enabling the lizard to run to a refuge while the surprised foe is occupied with the cast-off and wriggling tail. Such lizards have the power of regenerating a tail, or rather a substitute for one, since the new tail contains in place of real vertebræ only a non-segmented rod or tube of fibro-cartilage. In most of the higher lizards the muscles, skins, and scales are reproduced, but among a variety of lower forms the scaling is abnormal, and is sometimes a reversion to an ancestral form. Consult Boulenger, *Proceedings of the Zoölogical Society of London*, 1888, page 351; and id., 1891, page 466. See REGENERATION.

The skin of lizards, like that of snakes, is normally covered with scales, the thin, horny coating of which is shed periodically; but the amphisbænas have nearly lost all scales, and the glass-snake (Anguis) sheds its skin in one piece. In many cases, however, the scales are not typical, but appear as little tubercles (osteoderms), such as are seen in the geckos and Gila monster, so that the whole skin looks granular or 'pebbled'; or these dermal ossifications may be confined to the scales or shields of the head, as in the Lacertidæ. The skin is entirely devoid of glands, although certain minute excretory organs lie under the cutis of the thighs. Lizards vary greatly in color; the numerous desert-dwelling forms are, as a rule, of dull hue, and capable of little change, while forms dwelling in forests or grassy places are often highly colored, and have great power of metachrosis, as is familiar in chameleons. The chromatophores, according to Gadow, are imbedded in the deeper layers of the cutis, and send out movable contractile processes, in which their pigmental protoplasm is conveyed toward or away from the surface. Black, red, yellow and white, with their combinations of gray and brown, are the usual colors. The white pigment is made up of guanin salts. Blue and green are structural colors which are not traceable to pigment. (For the method of service of these voluntary color-changes in adaptation to surroundings, see META-

LIZARDS



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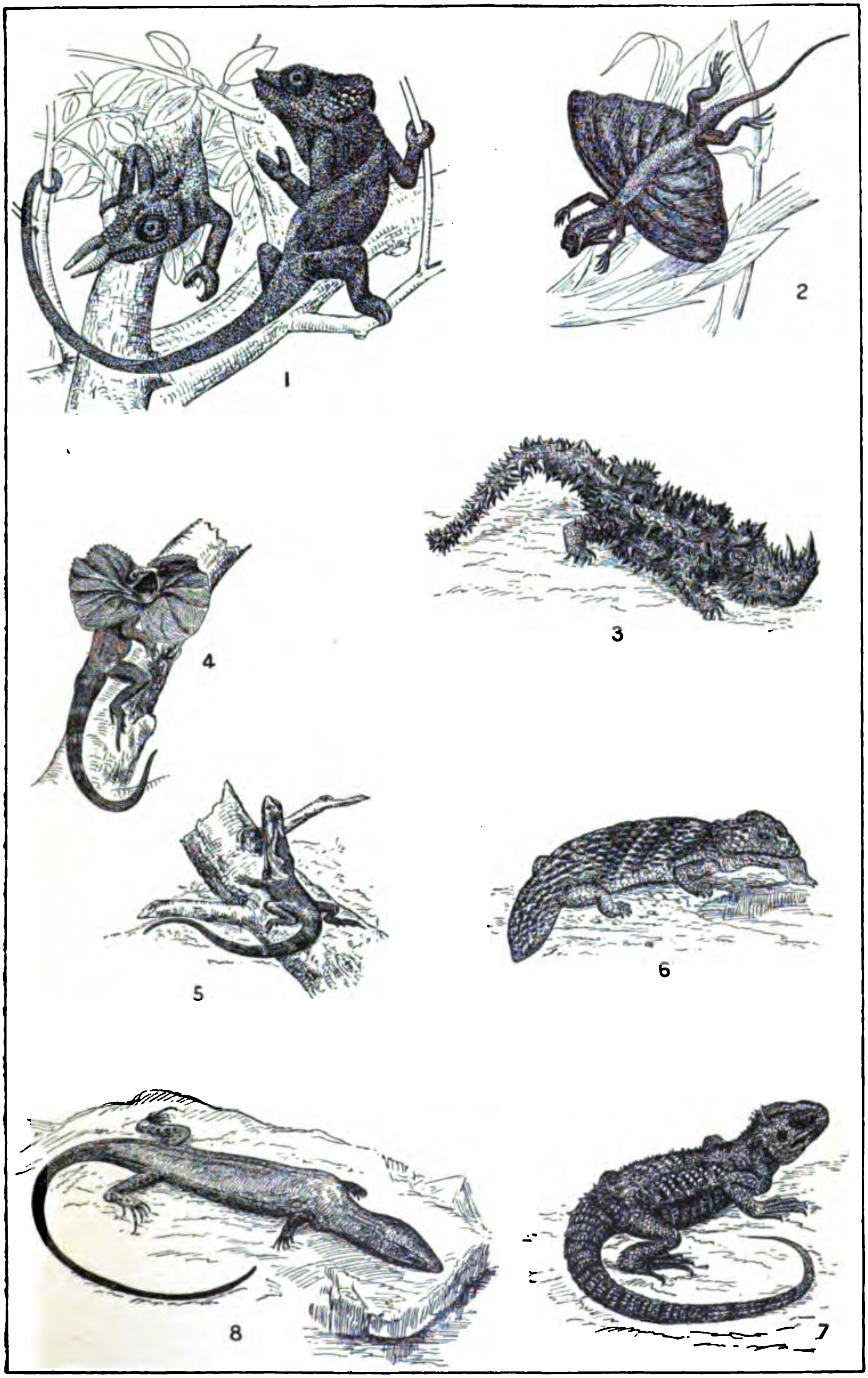
1 AMIVA SURINAMENSIS
2 URANISCODON PICTUM
3 MICROBLEPHARUS MAXIMILIANI
4 ANOLIS GRACILIS
5 HEMIDACTYLUS MABOUIA
6 ACANTHOPYGA STRIATA
7 ENYALIUS RHOMBIFER

LIZARDS



1. **AFRICAN TYPES OF CHAMELEON.**
2. **FLYING DRAGON (Draco volans).**
3. **AUSTRALIAN MOLOCH (Moloch horridus).**
4. **FRILLED LIZARD, with frill expanded.**
5. **FRILLED LIZARD, with frill folded.**
6. **AUSTRALIAN SKINK (Trachysaurus rugosus).**
7. **EUROPEAN AGAMA (Agama stellio).**
8. **EGYPTIAN MONITOR (Varanus Niloticus).**

chrosis.) In addition to protective coloration, some lizards are defended by horns and spines, which sometimes cover the entire body, as in the horned toads and the moloch (qq.v.), and sometimes grow only upon certain parts, most frequently the tail. Others have defensive or menacing appendages and corresponding habits, such as are manifested by the frilled lizards, the basilisk, the iguana, and others that make themselves look terrifying, when in fact, like all the rest (except Heloderma), they are harmless.

Lizards are found in all the warmer regions of the earth: their northern limit is about the annual isotherm of 50° F. (See Map under Distribution of Animals.) They are most numerous in tropical and warm countries; none occur in polar lands. In temperate regions they pass the winter in a state of torpidity concealed under ground and débris, or in hollow trees. Many are restricted to deserts, and have acquired interesting adaptations for resisting the blowing sand and otherwise withstanding the hardships of a hot and barren habitat. Other families are arboreal, or dwell among rocks. One species (of the Galapagos Islands) is marine, and several African and Oriental lizards are more or less completely aquatic. Most of these swift and agile reptiles are insectivorous, but some are carnivorous or even cannibalistic, and certain sluggish forms, as the iguanas, are herbivorous, and their flesh is palatable and nutritious for human use. The eating of noxious grubs and insects is a valuable service by lizards to man; and these little animals furnish food for a great variety of other reptiles, birds, and beasts of prey.

USE OF TONGUE BY CHAMELEON IN CATCHING INSECTS.

Classification. The lizards are regarded by recent authorities as one of two sections (the other being the snakes) of an order of reptiles, usually called Squamata. Dr. Gadow in a late (1900) review of the matter regards the lizards as an order (Autosauri, or Lacertilia), divisible into three sections:

(1) *Geckones* (vertebræ amphicœlous) contains the family Geckonidæ, comprising the geckos proper (Geckoninæ), the Eublapharinæ, and the Uroplatinæ. See Gecko.

(2) *Lacertæ* (vertebræ procœlous) contains the ordinary lizards—agamas, iguanas, African zonurids, glass-snakes, heloderms, monitors, South American tejids, typical Old World lizards (Lacertidæ), skinks, and several small families including the degraded amphisbænas and snake-like aniellids of California and the pygopodes of Australia.

(3) *Chamæleontes*—a single family with 50 or 60 species. See Chameleon.

Fossil Lizards. Fossil remains of lizards of the suborder Lacertilia are not well known. A few have been found in the Cretaceous and Tertiary rocks of Europe and North America, and the largest known lizard is a fossil species (*Varanus priscus*) from the Pleistocene beds of Queensland, Australia, which had a length from nose to tip of tail of about thirty feet. Many other fossil forms of lizard-like reptiles are not closely related to the Lacertilia of modern times. Such are the great 'sea-serpents,' Ichthyosaurus, Plesiosaurus, Mosasaurus, etc., of Mesozoic ages; the amphibious Rhynchocephalians of the Permian and Mesozoic, and some of the Mesozoic dinosaurs, all of which are described in separate articles. See Plates of Lizards; Iguanas and Other American Lizards.

Bibliography. Boulenger, *Catalogue of Reptiles in the British Museum* (London, 1889-96); Cope, "Crocodilians, Lizards and Snakes of the United States," in *Report of the United States National Museum* for 1898 (Smithsonian Institution, Washington, 1900); Gadow, *Amphibia and Reptiles* (London and New York, 1901); Van den Burgh, *Reptiles of the Pacific Coast and Great Basin* (San Francisco, 1897); Holbrook, *North American Herpetology* (Philadelphia, 1842); and standard works.

LIZARD-FISH. One of a family (Synodontidæ) of marine fishes of the order Iniomi (q.v.), which have elongated bodies, very wide mouths, small close scales, and usually photophores. Some inhabit deep waters, and others live near shore, mostly in the tropical regions. The name ordinarily refers in America to a mottled-olive (yellowish beneath) species (*Synodus fœtens*), common from South Carolina to Brazil on sandy shores, which is known also as 'lagarta,' 'galliwasp,' and 'soapfish.' It reaches a length of 12 inches, and, like the other species, is voracious and active. A well-known larger species of Southern Europe (*Synodus saurus*) is known among the Italians as 'lacerto' and 'tarentola.' See Plate of Lantern-Fishes.

LIZARD HEAD. The southernmost cape of England, in Cornwall, a bold headland amid picturesque cliff and rock scenery, 16 miles southwest of Falmouth (Map: England, A 6). It is surmounted by two fine lighthouses visible 21 miles. It is the *Promontorium Damnonium* of Ptolemy. The name Lizard is also applied to the peninsula of which the Head is the southern point.

LJUNGGREN, lyōōn'grĕn, Gustaf Hakon Jordan (1823—). A Swedish critic, born at Lund. He studied in his native town, was made docent of æsthetics at the university there in 1847, and in 1859 professor of æsthetics and literature. From 1875 to 1885 he was rector of the university. His principal work is *Svenska vitterhetens häfder efter Gustaf III.'s död* (1873-92), and his other literary and critical studies include: *Svenska dramat intill slutet af sjuttende arhundradet* (1864); *Bellman och Fredman's epistlar* (1867-69); *Smärre skrifter* (1872-81); and *Från en resa* (1871).

LLAMA, lä'mȧ (the native name). A South American quadruped of the camel family. It is no longer regarded as a distinct species, but as a domesticated variety of the guanaco (q.v.). It was in general use as a beast of burden on the Peruvian Andes, and the only beast of burden used by the natives of America, before the horse and ass were introduced by Europeans. It is still much used in this capacity on the Andes, the peculiar conformation of its feet enabling it to walk securely on slopes too rough and steep for any other animal. The burden carried by the llama should not exceed 125 pounds. When too heavily loaded the animal lies down and refuses to move, nor will either coaxing or severity overcome its resolution. It is generally very patient and docile. Its rate of traveling is about 12 or 15 miles a day. The llama is about three feet in height at the shoulder, has a long neck, and carries its head elevated. The females are smaller and less strong than the males, which alone are used for carrying burdens. The color is various, generally brown with shades of yellow or black, frequently speckled, rarely quite white or black. The flesh is spongy, coarse, and not of agreeable flavor. The hair or wool is inferior to that of the alpaca, but is used for similar purposes; that of the female is finer than that of the male. The llama has been introduced with the alpaca into Australia, but it is only adapted for steep mountain regions, and has never become generally useful. See Lama; Alpaca. See Plate of Camels and Llamas.

LLANDUDNO, lȧn-dụd′nô. A fashionable watering-place in Carnarvonshire, North Wales, situated between the Great and Little Orme's heads, 40 miles west-southwest of Liverpool (Map: Wales, C 3). It has picturesque surroundings, a fine beach for bathing, pier, marine drive 5½ miles long, promenade, golf links, hydropathic establishments, and good hotels. The town owns its water, gas, electric-lighting and power works in connection with a refuse destructor, and maintains abattoirs and markets. Population, in 1891, 7348; in 1901, 9300.

LLANELLY, lȧ-nĕth′lĭ. A market-town and seaport in Carmarthenshire, Wales, 10 miles west-northwest of Swansea (Map: England, B 5). It has large copper, iron, and tin-plate works, potteries, and neighboring coal-mines. Its docks are commodious and it carries on an important shipping trade in its industrial products. The town is progressive, and owns its water-works, markets, two market-halls, abattoir, athenæum, two town halls, park, pleasure grounds, free library, and considerable remunerative real estate. The United States is represented by a consular agent. Population, in 1891, 23,937; in 1901, 25,600.

LLANES, lyä′nȧs. A town on the north coast of Spain, in the Province of Oviedo, 44 miles west of Santander. It has a Gothic church built in the fourteenth century, a well-equipped high school, a new municipal hospital, and many interesting old buildings, among which are the ruins of an old fortress and several ruined palaces and convents. The town manufactures butter, cheese, pottery, and leather. It was formerly of considerable commercial importance, but its small, shallow harbor is now used only by a few coasting vessels. Population, in 1900, 18,781.

LLANGOLLEN, lăn-gŏl′len, *Welsh pron.* thȧn-gŏth′len. A town in Denbighshire, Wales, picturesquely situated on the Dee in the hill district (Map: England, C 4). The town is a great tourist resort, famous for the beautiful Vale of Llangollen and its antiquities. Among its interesting features is the bridge built in 1346 and considered one of the *Tri Thlws Cymru* ('three beauties of Wales'). Population, in 1891, 3225; in 1901, 3300. Consult Simpson, *History of Llangollen* (3d ed., Llangollen, 1852).

LLANO ESTACADO, lä′nô, *or* lyä′nô, ȧ′stȧ-kä′ᴅô. An extensive level plateau in northwestern Texas and southeastern New Mexico (Map: United States, E 4). It forms a part of the Great Plains along the eastern slope of the Rocky Mountains, from which it is separated by the valley of the Pecos River. It is about 180 miles in extent each way, and is bounded on all sides by steep escarpments or palisades, whence its Spanish name, which means 'palisaded plain.' These are highest on the eastern side, where they are eroded into very irregular lines by the headwaters of the numerous Texas rivers flowing into the Mississippi and the Gulf of Mexico. The top of the plateau is an arid waste almost destitute of surface water. Considerable quantities of water, however, collect during the wet season on the impervious bed-rock which underlies the porous sandstone, and can be obtained by boring. During the wet season, also, the plateau produces grass enough to support cattle, but agriculture cannot be carried on without irrigation.

LLANOS, lä′nōz, *Sp. pron.* lyä′nôs (Sp., plains). A common term in Spanish America for treeless plains, or prairies. In a restricted geographical sense it is applied to the great level tract in Venezuela and Colombia between the Orinoco on the east and the first foot-hills of the Andean Cordillera on the west, and stretching from the northern coastal regions of Venezuela to the forested regions of the Amazon basin. This region, measuring about 150,000 square miles, is elevated only a few hundred feet above the sea and for great distances presents an unbroken expanse of flatland. The lower portions (llanos bajos) lying along the rivers are subject to inundation during the wet season from June to October; they support a heavy growth of grass, which generally remains green throughout the year. The highest stretches (llanos altos) are more or less diversified by undulating or flat-topped hills; they present a changing appearance, being grass-covered during the wet season and almost barren in the dry months. Grazing is the chief industry of the inhabitants (llaneros), who are a mixed race of Spanish and Indian blood. The climate is hot, generally moist, and in some regions malarial. See Venezuela; Colombia.

LLANQUIHUE, lyȧn-kē′wȧ. A province in Southern Chile, bounded by the Province of Valdivia on the north, Argentina on the east, the Province of Chiloe on the south, and the Pacific Ocean on the west (Map: Chile, C 12). Its area is 7823 square miles. The surface is mountainous in the east and west, while in the centre is a valley occupied by Lake Llanquihue (q.v.), the largest in Chile. The province is well watered and to a great extent covered with forests. The climate is humid but healthful. The chief occupations are agriculture and forestry, and considerable quantities of agricultural and animal products and timber are exported to parts of Chile as well as to Germany. The inhabitants numbered 78,315 in 1895, including over 2500 Germans and other foreigners. The capital, Puerto Montt, on the southern coast of the province, has a good harbor and a population (1895) of 3480.

LLANQUIHUE. The largest lake in Chile. It is situated in the province of the same name, and at the base of the volcano of Osorno (Map:

Chile, C 12). It is 30 miles long and of the same width, and is of great depth. The lake receives hardly a single tributary, but has an outlet into the sea. It is fed by water filtered through the porous volcanic rock of which the region is composed. Its waters are remarkably clear and crystalline.

LLEWELLYN AP GRIFFITH, lōō-ĕl′ĭn ȧp grĭf′ĭth, or LLYWELYN AB GRUFFYDD (?-1282). A native prince of Wales. He and his brother succeeded their uncle, David ap Griffith, in 1246; in 1254 they quarreled and Llewellyn, conquering his brother, became sole ruler. He revolted from his allegiance to the English in 1256, and joined with the party of Montfort, but made peace with Henry III. in 1267. On the accession of Edward I. he refused to do homage. Edward summoned him both in 1274 and 1276, but he refused to appear. His wife, Eleanor de Montfort, was captured by the English in 1275, and his offers of a ransom for her were declined and war was declared against him in the following year. The English invaded his territory, and in 1277 he surrendered most of his domains and went to London, while Eleanor was given back to him. He soon returned to Wales, and, after being reconciled to his brother David, renewed the war with the English, by a sudden revolt on Palm Sunday, 1282; he was slain December 11 of the same year. Consult Rémont, *Simon de Montfort* (Paris, 1884).

LLORENTE, lyô-rân′tâ, JUAN ANTONIO (1756-1823). A Spanish historian, born at Rincon del Soto, near Calahorra, in Aragon. He took holy orders in 1779, but turned to the study of canon law, became advocate of the Council of Castile in 1781, vicar-general of Calahorra in 1782, and general secretary of the Inquisition in 1789. A Liberal of the party of Jovellanos (q.v.), he lost his employments when Jovellanos fell in 1801. In 1805 he won the favor of Godoy by an attack on the liberties of the Basque Provinces, published in the form of an historical essay. When the French invaded Spain, Llorente became a zealous Bonapartist and spoke against the Constitution of 1812. He had to flee to France on Napoleon's downfall in 1814. There he lived till 1822, when the publication of *Portraits politiques des papes* caused his banishment. He returned to Madrid and died there. Llorente's most important work is the *Histoire critique de l'inquisition d'Espagne* (1817-18), faulty in its exaggerations and its political bias, but valuable as the first comprehensive and systematic treatise on the subject. He also wrote the *Memorias para la historia de la revolución de España* (1811-16), and an autobiography (1818).

LLOYD, loid, CHARLES HARFORD (1849—). An English musician and precentor of Eton. He was born in Thornbury in Gloucestershire. At ten years of age he was organist of the church of Rangeworthy, and also frequently officiated at the near-by village of Farfield. In 1862 he took lessons under John Barrett of Bristol, who confined his studies almost entirely to Bach and Beethoven. His first composition was a mazurka, the "Pearl of Denmark," dedicated to the Princess of Wales (1863). Several of Tennyson's poems were set to music by him about this time. From 1865 to 1868 he studied under Handel Tovey, the organist at Rassall School. Here he first met Hubert Parry and formed a friendship which greatly influenced both their after lives. In 1868 he won an open scholarship at Magdalen Hall (now Hertford College), Oxford, where he went for the study of theology. The influence of Dr. Stainer, then organist of the college, caused him to give up all thought of orders and take up the study of music. He subsequently became conductor of the Gloucester Festivals of 1877 and 1880, and of various choral societies. His works include about a dozen important cantatas (*Hero and Leander*, *Song of Balder*, *Andromeda*, etc.), several part songs, and considerable church and organ music.

LLOYD, DAVID (1656-1731). An American jurist, born in North Wales. He was bred to the law, and in 1686 was sent as attorney-general to Pennsylvania by William Penn. Prior to 1700 he held many offices in the colony, and stood high in the esteem of the people. Later he took the side of the people against the proprietary, was several times Speaker of the Colonial Assembly, carried through many judicial reforms, and in 1718 was made Chief Justice of the province.

LLOYD, HENRY DEMAREST (1847-1903). An American author, born in New York City. He was educated at Columbia University, was for a time lecturer on political economy in New York schools, later studied law, and was admitted to the bar in 1869. From 1872 to 1885 he was connected with the *Tribune* of Chicago, latterly in an editorial capacity. He also held the secretaryship of the American Free Trade League. The first of his publications was *A Strike of Millionaires Against Miners* ("Our Bad Wealth Series," No. 1, 1890), described on its title-page as "An open letter to the millionaires," and narrating the story of the troubles at the Spring Valley (Ill.) coal-mines in 1889. From that time he carried on first-hand investigations of labor matters, and sought to cast the results of his study in readable form, not in the statistical tables of the economists. His *Wealth Against Commonwealth* (1894) is an examination of the methods of the Standard Oil Company. His works further include: *Labor Copartnership: Notes of a Visit to Coöperative Workshops, Factories and Farms in Great Britain and Ireland* (1898); *Newest England; Notes of a Democratic Traveller in New Zealand* (1900); and *A. Country Without Strikes: A Visit to the Compulsory Arbitration Court of New Zealand* (1900).

LLOYD, WILLIAM (1627-1717). Bishop of Worcester, England. He was born at Tilehurst, Berkshire; was educated at Oriel College, Oxford; was ordained priest in 1656, and made chaplain to Charles II.; became Dean of Bangor in 1672, and was made Bishop of Saint Asaph in 1680, Bishop of Lichfield and Coventry in 1692, and Bishop of Worcester in 1700. He took an active part in the religious controversies of his time, and was one of the seven bishops imprisoned in the Tower for their protest against the declaration of indulgences to Catholics and Dissenters by King James II. He supported the Revolution of 1688, and was appointed almoner to William and Mary and to Queen Anne. He furnished valuable materials to Bishop Burnet's *History of His Own Times*, and besides pamphlets on the Roman Catholic controversy, tracts, and sermons, published: *A Chronological Account* *of the Life of Pythagoras and of His Famous Contemporaries* (1699); *A Dissertation on Daniel's Seventy Weeks* (1690); and *A System of Chronology* (1690).

LLOYDS, loids. An incorporated association of underwriters, merchants, ship-owners, ship brokers, and insurance brokers. The home office of the association is in London, where it occupies a suite of rooms in the Royal Exchange. The objects for which the association was formed are, according to the act of incorporation: (a) carrying on the business of marine insurance; (b) the protection of the interests of the members of the association; and (c) the collection, publication, and diffusion of intelligence and information with respect to shipping. The association is composed of members and subscribers, and no others are allowed to avail themselves of the privileges of the rooms. The members are of two classes, underwriting members who pay an entrance fee of £100 and are required to deposit securities to the value of £5000 to £10,000 as a guarantee of their engagements, and non-underwriting members who pay a fee of twelve guineas. Subscribers pay an annual subscription of five guineas, but no entrance fee, and have no voice in the management of the affairs of the association. The management of the association and its operations is delegated to the 'committee for managing the affairs of Lloyds,' selected by the members from among themselves. Routine work is carried on by a secretary and assistants and a large clerical staff. The method of effecting insurance is for a broker to write upon a slip of paper the name of a ship and of her master, the character of the cargo, the amount at which it is valued, nature of the voyage, etc. If the risk is accepted each underwriter subscribes his name and the amount of it which he will underwrite, the insurance being effected as soon as the total amount is made up. As the premium rate largely depends upon correct information upon all points connected with the risk in question, one of the first requisites of the association has been an efficient maritime intelligence department, and in the development of this the greatest success has been achieved.

The association of Lloyds had its origin over two hundred years ago in the meeting of merchants for business and gossip in a coffee-house kept by Edward Lloyd in Tower Street, London. The earliest mention of these meetings appears in the London *Gazette* of February 18, 1688, but the character of the notice implies that they were then no new thing. Their growing importance led Mr. Lloyd to remove to Lombard Street in 1692, and soon afterwards he began the issue of *Lloyd's News*, devoted to mercantile and maritime information, eventually succeeded by *Lloyd's List* (published daily), the second oldest newspaper in London. The merchants and underwriters continued to meet in the same manner during the greater part of the eighteenth century without any apparent organization or rules, but as the business increased in volume, the merchants, underwriters, and associates moved first to a building in Pope's Head Alley and finally, in 1774, to the Royal Exchange. The association adopted in 1779 a printed form of policy differing but little from that in use to-day.

In 1811 the society was reorganized, and in 1871 incorporated. Its agents are to be found in every maritime port in the world frequented by deep-sea ships. *Lloyd's Register of British and Foreign Shipping* is a volume published annually containing information respecting vessels, their age, material, repairs, owners, captains, etc.; also details of docks and other maritime information. The office of the *Register* is distinct from Lloyd's of the Exchange.

The classification of ships, as regards their construction and seaworthiness, made by Lloyds surveyors and contained in the registers, dates from the middle of the eighteenth century, and in the earliest copy extant of *Lloyd's Register of Shipping*, dated 1764-65-66, vessels are classified in groups, designated by the letters A, E, I, O, U; A standing for a first-class ship. With these letters were used G, M, and B, referring to the equipment, and indicating whether it was good, middling, or bad. In the *Register* of 1768-69 the numbers 1, 2, 3, 4 are employed to denote the condition of the equipment, and the letters A, E, I, O, U are printed small. In the *Register* 1775-76 the hull is again described by Roman capital letters, and the equipment by the figures 1 and 2. As iron ships began to be used, it was found necessary to classify them into grades, and in 1869, on the adoption of new rules for ship-building, numbers were used for iron ships, and a system of classification followed which in the main is still used. This classification of ships was determined by rules adopted to govern ship-builders, and was universally recognized by merchants and others, as it enabled them to determine the seaworthiness of a vessel by consulting the register. See article A1 for modern systems of classifying wooden and iron ships. Consult the occasional publications of Lloyds; Lloyd's *Rules for the Building and Classification of Ships;* and *Annals of Lloyd's Register of British and Foreign Shipping* (London, 1884).

LLOYDS, AUSTRIAN. An association for general commercial and industrial purposes, founded in Triest by Baron Bruck in 1833, to supply the want, experienced by the maritime insurance companies of that port, of a central administration to attend to their common interests. This association, like its London prototype, has agents in all the principal foreign ports, whose duty it is to collect all information of a nature to affect the commerce and navigation of Triest, and to keep a list of all entrances and clearances of ships at their respective ports. This information is published in the *Giornale del Lloyd Austriaco.* This company has established regular communication between Triest and all the important seaports in the Adriatic and Levant, by means of a large fleet of steamers, which also carry the Austrian mails. The society of Austrian Lloyds includes three sections: the first is composed of insurance companies, the second of steamboat companies, while the third or scientific department (established in 1849) has a printing establishment, an engraving-room, and an artistic establishment for the perfecting of engraving on copper and steel. This last section has issued a great number of literary and scientific journals.

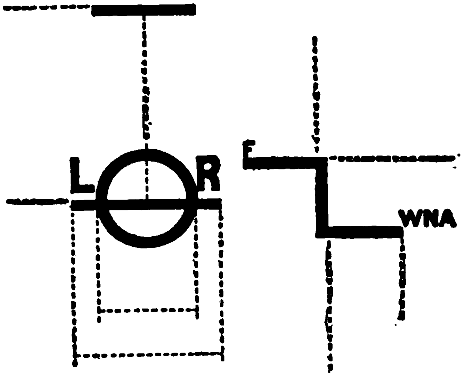
LLOYD'S BOND. The name of a security much employed in England during the period of railway construction, between 1850 and 1870, when railway companies were hampered by Parliamentary restrictions upon their borrowing power. A Lloyd's bond, so called because introduced by Mr. John Horatio Lloyd, an English barrister, is a sealed acknowledgment of indebtedness and can be issued by companies in return for materials or services rendered, but cannot be sold for money. They have been held by the courts to be a valid claim upon the property of a company, and to give the holder preference over ordinary creditors, although they possess no priority over debenture or mortgage bonds issued in accordance with the provisions of a company's charter. They constitute a preferred part of a company's floating indebtedness. English railways now have abundant borrowing power under the statutes, and are no longer issuing Lloyd's bonds.

LOACH, lōch, or GROUNDLING (Fr. *loche*, Sp. *locha*, *loja*, loach). A fish of the family Cobitidæ, closely related to the carp family, which has an elongated body, covered with small scales, and a small head with four to ten barbules around the mouth. The common species (*Nemacheilus barbatulus*) of the rivers and brooks of Great Britain seldom exceeds four inches in length, and is highly esteemed by anglers and for food. The lake loach (*Misgurnus fossilis*) of the Continent is sometimes a foot long, and inhabits the mud of stagnant waters, which gives its flesh a bad flavor. See Plate of CARP AND THEIR EUROPEAN ALLIES.

LOADING, DENSITY OF. See BALLISTICS.

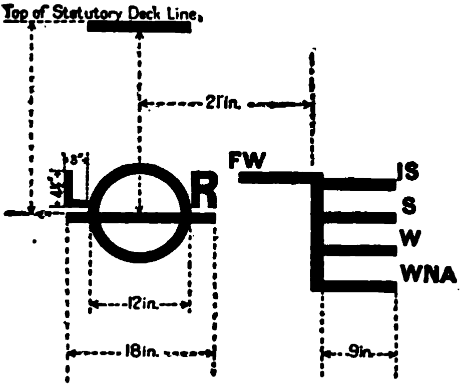
LOADING-TRAY. A contrivance designed to facilitate the placing of projectiles in the bore of a heavy breech-loading gun without injuring the threads in the screw-box or seat of the breech-plug. It consists of soft metal or of wood with a lining of thin metal on its upper surface and covers the threads at the bottom of the screw-box. The ordinary loading-tray must be placed in the breech after it is opened, and removed before it is closed. This takes several seconds, and, to avoid the loss of time thus entailed, some recent designs of breech-mechanism provide a loading-tray which is automatically placed in position.

LOAD-LINE MARKS OF VESSELS. The load-line or load water-line of vessels is the line in which the plane of the water surface cuts the hull of a ship when the latter is loaded. Many vessels are lost from overloading, and this fact led Samuel Plimsoll (q.v.), a member of the British Parliament, to prepare his Merchant Shipping Act, which became a law in 1876. This act was amended by the Merchant Shipping Acts of 1890 and 1894, and the marks provided for in those acts and the rules of the British Board of Trade are shown in the accompanying sketches. The abbreviations used have significance as follows: FW, fresh water (i.e. the load-line when in fresh water); IS, Indian summer (summer load-line in the Indian Ocean); S, summer; W, winter; WNA, winter, North Atlantic; F, fresh water (in the case of sailing ships). These marks are painted on the sides of iron ships, white or yellow on a dark ground, or black on a light ground, and the position of the disk and of each of the lines must be permanently marked on iron and steel by centre punch marks, and on wooden vessels the disk and lines are to be cut into the wood to a depth of not less than a quarter of an inch for the full width (1 inch) of the line. The upper edge of the line which crosses the disk passes through the centre of it and is the permitted freeboard in salt water during summer. The upper edges of the other lines are the permitted freeboard under the various conditions. After the load-line markings have been placed upon a vessel in accordance with the tables for assigning freeboard, their positions must be verified and approved by the Board of Trade, which issues a certificate of approval. This certificate may cease to be in effect after a survey which reduces the vessel in classification; in this case a new certificate must be issued (with possibly a new placing of the marks).



FREEBOARD MARKING FOR SAILING VESSELS.

When the markings are duly placed, newly or originally, their positions and accuracy are verified by *Lloyd's Register* surveyors, and upon this being reported to the committee, a freeboard certificate is forthwith issued. Without such a freeboard certificate a British vessel cannot clear (the British expression is 'enter outwards') from any port in Great Britain. Although the Load-Line Act applies only to British vessels, the Committee of *Lloyd's Register* assigns freeboard for foreign vessels in accordance with the tables, if the owners make application for the assignment; and it issues, with the concurrence of the Board of Trade, certificates similar to those given British vessels.



FREEBOARD MARKING FOR STEAMERS.

The position of the 'statutory deck-line,' from which the load-lines are measured, is defined in the Merchant Shipping Act of 1876 as follows:

"Every British ship (except ships under 80 tons register employed solely in the coasting trade, ships employed solely in fishing, and pleasure yachts) shall be permanently and conspicuously marked with lines of not less than 12 inches in length and 1 inch in breadth, painted longitudinally on each side amidships, or as near thereto as practicable, and indicating the position of each deck which is above water.

"The upper edge of each of these lines shall be level with the upper side of the deck plank next the waterway at the place of marking.

"The lines shall be white or yellow on a dark ground, or black on a light ground."

The line abreast the uppermost deck which extends the full length of the ship is the 'statutory deck-line.'

Under the British Merchant Shipping Act of 1894, the Committee of *Lloyd's Register* is empowered to assign freeboards to British vessels as required by the act. The form of marking adopted by Lloyd's is shown in the sketches, the letters L and R on each side of the disk indicating that the freeboards were assigned by the committee. Consult: *Lloyd's Seaman's Almanac* (London, 1893); *Lloyd's Rules and Regulations for the Construction and Classification of Steel Vessels* (London, 1901); *Instructions to Measuring Surveyors* (London, 1891).

LOAM (AS. *lām*, OHG. *leimo*, Ger. *Leim*, *Lehm;* connected with AS. *līm*, Eng. *lime*, Lat. *limus*, mud, and ultimately with AS. *slīm*, Ger. *Schleim*, Eng. *slime*). A term much employed by agriculturists and others to designate a soil consisting of a mixture of clay, sand, and decomposing organic matter (humus). The clay present varies from 20 to 50 per cent.; lime is sometimes present, though seldom exceeding 5 per cent. Loamy soils are not stiff and tenacious like clay soils, and are more fertile than sandy soils. Their physical properties are such that they hold moisture for plant use more tenaciously than either clay or sand, but do not hold hygroscopic water as strongly as clay or as weakly as sand. Loams are abundant in valleys, especially where the river is bordered by a flood plain. The clay used for making bricks is often really a loam in which the proportion of humus is very small. In Italy, France, and other countries walls are made of such loam beaten down between planks at the requisite width; and these walls become very solid, and last for centuries. See Soil; Clay; Marl; Sand.

LOAN (AS. *lān*, *læn*, OHG. *lĕhan*, Ger. *Lehen*, *Lehn*, loan; connected with Goth. *leihwan*, AS. *lēon*, OHG. *līhan*, Ger. *leihen*, to lend, OIr. *leicim*, I leave, Lith. *likti*, Lat. *linguere*, Gk. λείπειν, *leipein*, *Skt. rich*, to leave). In law, 'loan' signifies either the delivery of money or any personal property by one person to another for which an equivalent return in kind is to be made, or the bailment of a personal chattel to be specifically returned to the person making the loan. (See Bailment.) An important distinction to be noted between the two classes of loans is that in the first title to the property lent passes to the borrower and the person making the loan has only a contract right, in the case of personal property, to recover damages if the borrower fails to pay, or in a proper case he may compel specific performance (q.v.), and in the case of money to recover in an action of debt. In the second class the borrower or bailor acquires possession only and not the title of the property borrowed, and the lender may compel a return of the property lent by an action in replevin or recover damages for its conversion (see Trover) if the borrower fails to return it.

The second class of loans may belong either to the class of bailments for the mutual benefit of the bailor and bailee, in which case the bailee is bound to exercise due care for the safety of the property lent—that is, such care as a prudent man would take of his own property—or they may belong to the class of gratuitous bailments, the delivery of an article to the bailee, for his use, without compensation, and on condition of its return to the bailor. As this kind of bailment is entirely to the advantage of the bailee, he is bound to use extraordinary care, and is responsible for slight negligence in the use of the bailment. He is not responsible for the natural deterioration by ordinary wear and tear of the article delivered, but with that exception must return the article to the bailor in as good condition as when it was received. The diligence to which the bailee is held in the care of the property depends upon its character and value, and the dangers to which it is exposed. See Bailment. Consult the authorities referred to under Contract.

LOANDA, lō-ăn'dȧ, Saint Paul de. A seaport of Africa. See Saint Paul de Loanda.

LOANGO, lō-ăṉ'gō. A coast district of West Africa, extending about 200 miles northward from the mouth of the Congo to the vicinity of Mayumba. The coast is partly low and marshy, partly steep and rocky, and the interior rises in terraced plateaus. The chief products are palm-oil and rubber. The northern half of the district lies within the French Congo; the extreme southern part belongs to the Congo Free State, while the middle portion, called Cabinda (q.v.), belongs to Portugal. The Loango district was originally a part of the native Congo Empire. It was then for a time an independent native kingdom until the arrival of the Portuguese, the Dutch, and the French, in the seventeenth and eighteenth centuries. It was for a long time the centre of the West African slave trade. The chief settlement is Loango.

LOANGO. The chief settlement on the French Loango (q.v.) coast, West Africa, and the principal commercial port of the French Congo, situated 100 miles north of the mouth of the Congo River (Map: Africa, F 5). During the independence of the native Loango State it had a population of over 15,000, but is now little more than a collection of European trading factories. It has a well-sheltered roadstead with considerable shipping.

LOAYZA, lō-ī'thȧ, or **LOAYSA**, lō-ī'sȧ, Jerónimo de (c.1500-75). A Spanish missionary to South America, born at Trujillo. He entered the Dominican Order, left for Cartagena in 1526, was made bishop in 1537, built a cathedral and established a school. He was transferred to the See of Lima, arriving in 1543, and was later made the first archbishop. He acted as peace-maker in several rebellions, but after the death of the Viceroy, Mendoza, took the field against Giron. His chief work was the establishment of the Hospital of Saint Anne, which is still in existence.

LOBACHEVSKY, lō'bȧ-chĕf'skē, Nikolai Ivanovitch (1793-1856). A Russian mathematician, born at Nijni-Novgorod, the son of a peasant. He studied at Kazan, where he became adjunct professor of mathematics in 1814 and professor in 1816. He held this position for forty years, and for nineteen years he was rector of the university. In 1829-30 he published the first geometry which was not based upon the Euclidean postulate of parallel lines (see the article Geometry), and thus became the founder of the Non-Euclidean geometry. (See also Bolyai.) His works are as follows: *Principles of Geometry* (original in Russian, 1829-30); *Imaginary Geometry* (original in Russian, 1835); *New Principles of Geometry, with a Complete Theory of Parallels* (original in Russian, 1835-38); *Geometrische Untersuchungen zur Theorie der Parallellinien* (original in German, 1840; new German ed. 1887, English trans. 1891); *Pangéométrie ou précis fondé sur une théorie générale et rigoureuse des parallèles* (original in French, 1855). His complete works were edited by Janischevsky (1870), and have been translated by Hoüel, Battaglini, and Halsted. A collection of his geometrical writings appeared in Kazan. The first volume of this collection, published in 1883, contains Lobachevsky's Russian articles only and bears a Russian title; the second and last volume, published in 1886, contains his French and German articles, and, besides the Russian title, bears also the following title in French: *Collection complète des œuvres géométriques de N. I. Lobatcheffsky.* Consult: Hoüel, in the *Bulletin des sciences mathématiques* (1879); Vassilieff, *Eloge historique de Nicolas Lobatchevsky* (English trans. Austin, Tex., 1894). For his geometry, consult *New Principles of Geometry, with Complete Theory of Parallels,* translated from the Russian by Halsted (Austin, Tex., 1897).

LOBANOFF-ROSTOVSKI, lô-bä'nôf-rô-stôf'-skê, Prince Alexei Borisovitch (1825-96). A Russian statesman. He entered one of the departments of the Ministry of Foreign Affairs in 1844; became attaché of the Russian Embassy at Berlin in 1850; and at the close of the Crimean War became counsel to the legation at Constantinople, where he was afterwards Minister Plenipotentiary from 1859 to 1863. A scandal interrupted his diplomatic career for several years, after which he reëntered public service in the Department of the Interior as Governor of Orel in 1866 and was Assistant Secretary of War in 1867-68. He represented his Government at Constantinople, 1878-79; London, 1879-82; and Vienna, 1882-95. In January, 1895, he was appointed Minister Plenipotentiary to Germany, but never started for Berlin, as on the death of M. de Giers he became Minister of Foreign Affairs on February 26 (March 10) of the same year. His policy was vigorous. He died suddenly while traveling to Kiev, August 30, 1896.

LOBAU, lō'bou. An island about five miles below Vienna, in the Danube, noted for its connection with the battle of Aspern and Essling, between Napoleon I. and the Austrians under Archduke Charles (May 21-22, 1809). From Lobau Napoleon threw bridges across both arms of the Danube, and crossed to the left bank on the 21st. On the night of the 22d the defeated French regained the island and held it until July 4th, when the river was again crossed, and the battle of Wagram was won on July 6th.

LOBAU, lô'bō', Georges Mouton, Count de (1770-1838). A marshal of France. He was born February 21, 1770, of an obscure family at Pfalzburg in Lorraine. In 1792 he entered the army as a private, and served with distinction in the armies of the North and of Italy, becoming in 1799 aide-de-camp to Joubert. Later he attracted the attention of Napoleon, who made him in 1805 his own aide-de-camp, and in this capacity he served during Napoleon's campaigns in Germany. In 1807 he became a general of division, and in 1808 he took a prominent part in the campaign in Spain. In 1809 he returned to Germany and distinguished himself especially at Landshut, and in the battle of Aspern (q.v.), where his brilliant assault on the village of Essling enabled the French to recross the Danube in safety to the island of Lobau, for which service Napoleon created him Count de Lobau. He was taken prisoner by the allied forces after the battle of Leipzig (1813), and returned to France only after the first Restoration. Having supported Napoleon after his escape from Elba, and fought at Ligny and Waterloo, he was not allowed to return to France until 1818. After the Revolution of 1830 he became commander-in-chief of the National Guard, and was made marshal and peer of France in 1831.

LOBBY (ML. *lobia, lobium, laubia,* from OHG. *loubă,* Ger. *Laube,* arbor, from OHG. *loub* Ger. *Laub,* leaf). That part of the assembly hall of a legislative body where private persons are permitted to enter for the purpose of consulting with members. In the political vocabulary of the United States, the term refers also to the persons who frequent this place for the purpose of influencing the votes of legislators. They are called 'lobbyists' and their business 'lobbying.' One of the leading causes of the lobby in the United States is the method of legislation by committees, bills being first discussed by small committees and frequently approved by the legislature after little or no public debate. It may thus happen that a measure of importance to an individual or corporation may be carried through the legislature without arousing the consideration which its real nature demands. This method enables powerful interests to bring pressure to bear upon the legislative committee to induce a favorable report which could not be exerted effectively upon the legislative body as a whole. Corporate interests habitually maintain experienced and influential lobbyists at American legislatures. The constitutions of most of the States of the Union have attempted to lessen the evil of illegitimate lobbying by forbidding the legislature to enact laws of special application and by providing heavy penalties for the offense of bribery. Several States, notably California and Georgia, have gone even further and made the business of lobbying a felony punishable by disfranchisement and disqualification from holding office, in addition to the regular penalty for felony. The constitutions of North Dakota and Wyoming declare that the practice of log-rolling, which is really a form of lobbying, shall be treated as bribery, while the Constitution of South Dakota requires of every member of the Legislature an oath that he has not accepted a free pass on a railroad for any vote which he may cast or influence which he may exercise in the enactment of any law. The courts have repeatedly held that contracts which may have for their object the influencing of legislation in any other than the recognized and legitimate mode must be held void.

Consult: Bryce, *The American Commonwealth* appendix (2 vols., New York, 1895); Cooley, *Constitutional Limitations*, p. 166; Tanner, *The Lobby and Public Men* (Albany, 1888); *Report of the United States Railway Commission*, p. 84; *First Report of the Interstate Commerce Commission*, p. 7.

LOBE. In decorative design, any leaf-like subdivision of a motive. The commonest applications of the term are (*a*) to the main divisions of an acanthus-leaf or other compound conventional leaf, and (*b*) to the several projections of a scallop form, as in trefoils, quatrefoils, etc., in tracery, i.e. to the curve included between any two cusps. See CUSP; FOIL.

LOBE, lō'be, JOHANN CHRISTIAN (1797-1881). A German musician, composer, and writer on musical topics, born at Weimar. He studied the flute and violin, as a pupil of August Riemann and later of A. E. Müller, appeared in 1811 as a solo flutist at the Leipzig Gewandhaus, and became flutist and subsequently viola-player in the Weimar grand-ducal orchestra. In 1841-45 he conducted at Weimar an institute for theoretical instruction in music, and in 1846 established an institute of music at Leipzig, where he also edited the *Allgemeine Musikalische Zeitung* until it ceased publication in 1848. From 1853 to 1857 he published and edited the *Fliegende Blätter für Musik*, and later was musical editor of the *Illustrirte Zeitung* of Leipzig. He also became well known as a writer of sarcastic and witty feuilletons. His compositions, including six operas, two symphonies, quartets for pianoforte and strings, and a number of flute solos, are technically skillful and finished, but rather commonplace in their material. In his didactic works, particularly the *Katechismus der Musik* (1851; 25th ed. 1893), he presents the science of music to amateurs in a clear and intelligent fashion.

LÖBE, lẽ'be, WILLIAM (1815-91). A German agricultural writer, born at Treben, Saxe-Altenburg. For many years he was a farmer, but in 1840 he removed to Leipzig and began to write on agricultural subjects. Among his numerous works are: *Encyklopädie der gesamten Landwirtschaft* (6 vols., 1850-52; supplement 1860); *Handbuch der rationellen Landwirtschaft* (7th ed. 1887); and *Die Milchwirtschaft* (2d ed. 1889).

LOBECK, lō'bĕk, CHRISTIAN AUGUST (1781-1860). A German philologist and antiquary. He was born at Naumburg-an-der-Saale, and, after studying at Jena and Leipzig, was professor extraordinarius at Wittenberg from 1810 to 1814, when he became librarian and professor ordinarius of ancient literature and eloquence at Königsberg. He retained the latter post until his death. He is remembered chiefly for his contributions to the study of Greek grammar and mythology. Among his works were the *Paralipomena Grammaticæ Græcæ* (2 vols., 1837); *Pathologiæ Sermonis Græci Prolegomena* (1843); and the *Aglaophamus, seu de Theologiæ Mysticæ Græcorum Causis* (2 vols., 1829), which is particularly valued for its accurate and exhaustive treatise on the Orphic sect and literature. He also edited some Greek texts, including the *Ajax* (Αἴας) of Sophocles, with a commentary (1810, 3d ed. 1866). His selected academic speeches were published by Lehnerdt (1865). Consult: Friedländer, *Mitteilungen aus Lobecks Briefwechsel* (Leipzig, 1861); and *Ausgewählte Briefe von und an Lobeck und Lehrs* (Leipzig, 1894).

LOBEIRA, lô-bā'ê-rȧ, VASCO DE (?—?). A Portuguese knight who won his spurs in the reign of John I., or in that of Ferdinand II. Fernam Lopes, the chronicler who recorded this, contradicts himself. Lobeira's greatest title to fame is probably undeserved, for more recent investigation tends to deny him the authorship of the romance of *Amadis of Gaul*, which may rather have been written by his great-grandfather, João Pires Lobeira. Consult: Vasconcellos, "Portugiesische Litteratur," in Gröber's *Grundriss der romanischen Philologie* (Strassburg, 1894); Braunfels, *Kritischer Versuch über den Amadis von Gallien* (Leipzig, 1876).

LOBEL, lô-bĕl', DE LOBEL, or LOBELIUS, MATTHIAS (1538-1616). A Flemish botanist. He was born at Lille, and was educated as a physician. He traveled through Europe, and afterwards was appointed botanist to James I. of England. The genus of plants called *Lobelia* was named after him. He was author of *Stirpium Adversaria Nova* (1570); *Plantarum seu Stirpium Historia* (1576); and *Icones Stirpium* (1581).

LOBE'LIA (Neo-Lat., named in honor of Matthias Lobel). A genus of about 200 species of plants of the natural order Lobeliaceæ, which by some botanists is united with Campanulaceæ, but by other authors is considered to be distinct. The species are natives of tropical and temperate climates, abounding chiefly in damp woods in America and the north of India. They are generally herbaceous or half-shrubby, and have a milky, often very acrid, juice. *Lobelia Tupa* is a Chilean and Peruvian plant, of which the very smell excites vomiting. The cardinal-flowers (*Lobelia cardinalis* and *Lobelia fulgens*) and the blue cardinal (*Lobelia syphilitica*), natives of the warmer parts of North America, are favorite garden plants. *Lobelia Erinus* with its many forms is a common border plant, and the forms grouped under *Lobelia hybrida* are extensively grown in France and elsewhere, but are little known in America. Indian tobacco (*Lobelia inflata*), of North America, an annual, with an erect stem, a foot high or more, with blue flowers, has been used as a medicine from time immemorial by the aborigines of North America, and was introduced into Europe in 1829 by Dr. Reece. The chemical constituents of Lobelia are an alkaloid, lobelin, a peculiar acid,

LOBELIA INFLATA, INDIAN TOBACCO.

to which the term lobelic acid has been applied, inflatin, lobelacrin, etc.

LOBENGULA, lō'bĕn-gōō'lȧ (c.1833-94). A king of the Matabele. He succeeded his father, Mosilikatse, in 1870, made Buluwayo his capital and boldly opposed European civilization, threatening with death any of his people who accepted Christianity. After the discovery of gold in his territory (1872), Portugal, the Transvaal, and Great Britain strove to win supreme control over Lobengula's kingdom. In 1888 he signed a treaty with England admitting her suzerainty. Two years afterwards the British South Africa Company obtained permission to settle in Mashonaland, and for three years it paid the King a yearly rent. But in 1893, provoked by the insolence of the company, Lobengula attacked the English. He was terribly beaten; his capital was taken; and in his flight, after ambuscading the forces of Major Wilson, he was himself killed.

LOBLOLLY BAY. A North American tree. See GORDONIA.

LOB-NOR. A lake in Central Asia, situated near the southern boundary of East Turkestan, at the northern base of the Altyn Tagh Mountains, and surrounded by the great Central Asian desert. It is the sink of the Tarim, the principal river traversing the desert of East Turkestan. Considerable attention has been attracted to it owing to the seemingly conflicting reports of the two Central Asian explorers Prjevalsky and Sven Hedin. The truth seems to be that the so-called lake consists of a system of several lake basins, in which the water from the river, owing to their shallowness and the level surface of the country, flows now into one, now another. The basins nearest the river contain fresh water, while the farthest sinks are salt, and all are surrounded by marshy, reedy tracts. Judging from old Chinese records, the lakes are remains of a large lake which covered the region.

LO'BO, JERONIMO (1593-1678). A Portuguese missionary to Abyssinia. He was born at Lisbon, joined the Jesuits in 1609, and became professor at the College of Coimbra in 1621. After a short stay in India, he set out for Abyssinia in 1625, and carried on successful mission work there for many years. Expelled from the country on the death of the Christian King, he returned to Europe and sought to stir up Spain and the Pope against the Abyssinians. Failing, he went to India, where he became Jesuit provincial of Goa. In 1656 he was back at Lisbon, where he spent the rest of his life engaged in literary pursuits. In 1659 he published a history of Ethiopia, which was translated by Dr. Johnson in 1735.

LOBOC, lō-bōk'. A town of the island of Bohol, Philippines, situated on the Rio Soca, four miles from the southern coast and 12 miles east of Tagbilaran. Population, in 1896, 10,175.

LOBOS (lō'bōs) **ISLANDS,** or SEAL ISLANDS. Two small groups of rocky islands off the coast of Peru, famous for the great quantity of guano which they contain (Map: America, South, A 3). The largest island of the northern group, Lobos de Tierra, lies in latitude 6° 29′ S., 12 miles from the mainland, and is about five miles long and two miles broad; the southern group, Lobos de Afuerra, lies about 25 miles farther south. More than 8,000,000 tons of guano have been exported.

LOBSTEIN, lŏp'stīn, PAUL (1850—). A German Protestant theologian, born at Epinal (Vosges). He studied theology at Strassburg, Tübingen, and Göttingen, was appointed a lecturer in the theological faculty at Strassburg in 1876, received a professorship there in 1877, and from 1884 held the chair of dogmatics. His theological views became those of the school of Albrecht Ritschl (q.v.). His publications include: *Die Ethik Calvins* (1877); *Petrus Ramus als Theolog* (1878); *La doctrine de la Sainte Cène* (1889); and *Études christologiques* (1890-94). He also contributed to the *Revue Chrétienne* and to Lichtenberger's *Encyclopédie des sciences religieuses.*

LOBSTER. The largest of crustaceans (*Homarus Americanus*), standing at the head of the macrouran decapods. (See CRUSTACEA.) Its allies are the shrimps, prawns, and especially the crayfish, from which group it differs in having very large claws (chelæ). In the lobster the head and thorax are united into one region, the cephalothorax, covered by the shield or carapace, which really is an enlargement of the dorsal portions of two segments, i.e. those bearing the second pair of antennæ and the mandibles. The body of the lobster consists of twenty segments, of which the seven in the abdomen are distinct, while the thirteen others, forming the thorax and head, are partly aborted, and more or less fused together. There are two pairs of antennæ, a pair of mandibles, two pairs of maxillæ or footjaws, and three pairs of accessory footjaws or maxillipeds. The first pair of legs (chelipeds) end in the large chelate or nipper-like claws. The smaller of the large claws ('fish-claw' or 'quick claw') is slender, toothed, and incurved at the tips, so that lobsters seize fish and shells, and grapple with one another. The other claw is thick and heavy, adapted for crushing heavy objects, and is called the 'club,' 'knobbed,' or 'numb claw.' Variations occur in the position of these claws, being either on the right or left side. Lobsters have been observed to transport small stones in their claws while engaged in burrowing. The abdominal legs are, with the exception of the first pair, two-branched and called the swimming legs, or swimmerets. Of these the first pair are slender and not divided in the female, while in the male they are much larger, thicker, and modified to serve as pairing organs, forming when placed together a funnel-like apparatus through which the spermatophores pass into the openings of the oviducts. The last pair of appendages are very broad, attached on each side of a plate (telson) which represents the last segment of the body.

The eyes are large, compound, situated at the end of a thick movable stalk, supposed by some to represent the appendages behind. As to the visual powers of the lobster we know very little. Judging by experiments made on insects with similar faceted eyes, they are probably near-sighted and depend more on perceiving the movements of other animals than clearly distinguishing their definite outlines. The sense of hearing is well developed, the rather complicated ear being situated in the broad joint of the smaller or first antenna. This consists of a membranous sac indicated by a clear oval space on the upper side of the joint, with a series of delicate feathery hairs arising from a ridge and provided each with a nerve, the ends of the hairs being immersed in a glairy fluid. The sac is penetrated by a slit through which pass water and minute grains of sand, which perform the function of otolites or the ear-bones of man. Waves of sound impinge on the ear, the grains of sand shake about, and the vibrations are transmitted to the sensitive feathery hairs, thence to the nerves, which unite to form the auditory nerve given off from the complicated brain, which is situated under the solid rostrum or beak.

The sense of smell is evidently acute and is lodged in little olfactory rods arising from the joints of the outer flagella of the first pair of antennæ. As in insects and other animals, it is this sense which directs them to their food, rather than that of sight or even touch, the latter sense residing in the delicate hairs fringing the mouth and other head-appendages. Lobsters are sensitive to light, and are much more active at night than by day, seeking food or their mates in the darkness.

Habits. The food of the lobster is living as well as dead fish, the usual bait for lobster-traps being fresh dead fish. The food is comminuted in the fore-stomach (proventriculus), which is very large and capacious, and at the posterior end the opening into the intestine is lined with a few very large teeth which serve as a strainer, through which the food presses into the long straight intestine, which opens externally on the under side of the telson. Lobsters are known to live on snails, breaking off the shell of large ones piece by piece and picking out the soft parts, or swallowing small ones whole.

It is known that crabs are very active and will if transported several miles from their original habitat find their way back. Several lots of lobsters marked with a tag were liberated at Woods Hole, Mass., after they were stripped of their eggs. They all moved toward the southwest. One made the journey from Woods Hole to Cuttyhunk, a distance of 12 miles, in three days. One traveled 16 miles in twenty-seven days. A number returned to their original habitat at Cuttyhunk. Whether this forced migration is due to the so-called 'homing instinct,' or that they are impelled to seek cooler water, remains to be seen; none moved northward up Buzzard's Bay into the warmer waters. As is well known, the lobster can shoot backward to a considerable distance by suddenly flexing the abdomen under the cephalothorax, going according to Herrick "25 feet in less than a second."

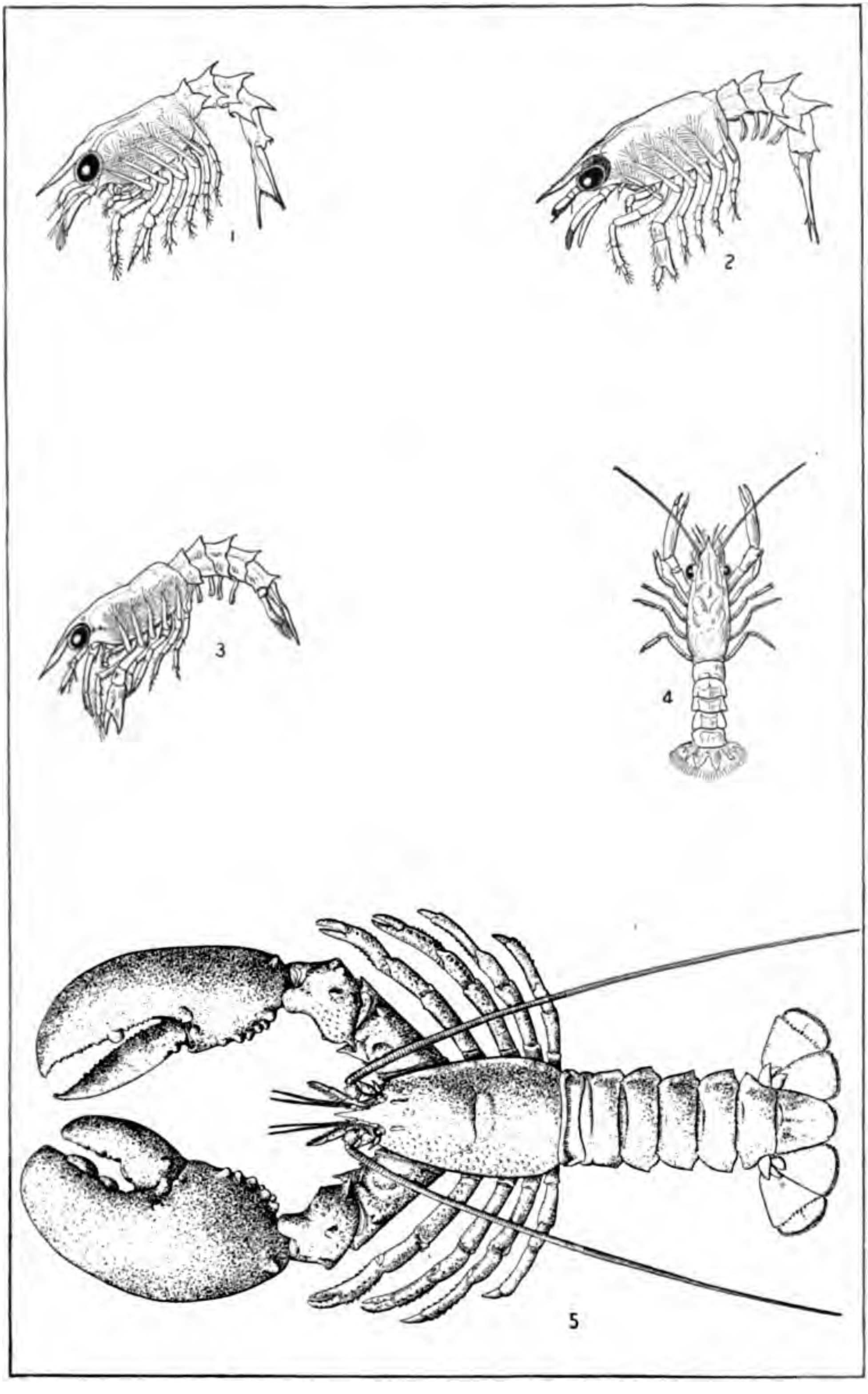
The geographical range of the lobster is from Henley Harbor, Labrador, at the eastern mouth of the straits of Belle Isle, southward to Delaware Bay, though stragglers have been found off Cape Hatteras in thirty fathoms, and at Beaufort, N. C. They have been captured on the fishing banks of the bays of Maine and Nova Scotia, and have been taken from the stomachs of cod caught on George's Bank. They are usually, however, found near rocky shores below low-water mark to a depth of 10 to 20 fathoms; toward winter they migrate into water from 35 to 40 fathoms deep. Large individuals weighing 20 pounds have been taken on the Maine coast, and were males, yet females 19 and 18½ inches in length have been captured. They are bottom-feeders, never rising more than a few feet above the bottom.

In walking they rest on the tips of the slender legs, extending the large claws forward in front of the head; while the swimming feet aid in progression. They are said to catch the sculpin and sea-robin, and are supposed not infrequently to catch other fish.

Reproduction and Breeding Habits. The ovaries ('coral') and corresponding male glands are voluminous organs, the testes being white, and the ovaries, when the lobster is about to spawn, being pale green, and the ovarian eggs quite distinct. The eggs pass out of an opening on the basal joint of each of the walking legs of the second pair; the seminal ducts in the male open on the basal joint of each of the last or fifth pair of legs. Pairing has never been observed, but it is known to take place in spring and summer. The breeding season is in July and August, though the eggs may be laid in the spring or autumn, and even in winter. The eggs are extruded and carried on the under side of the body attached by a cement in bunches to the hairs of the swimming legs, the process taking place most probably in the night or early morning. The number of eggs laid is estimated to vary from 5000 to 80,000, and in some cases even to 100,000. The average number of eggs laid by a lobster eight inches long, when sexually mature and 'in berry' or carrying eggs, is 5000; a ten-inch lobster bears about twice as many eggs, and one of 12 inches carries double the number borne by one which measures 10 inches. When the fourteen to sixteen inch limit is reached there is a decline in sexual vigor. Female lobsters become sexually mature when from eight to twelve inches in length. The variation in the number of eggs borne by lobsters of the same length is often very great.

Embryology and Metamorphosis. The lobster has a much shorter larval life than most decapod crustacea, and its development is in fact direct, its metamorphosis being incomplete. The period of incubation at Woods Hole is about ten months, from the middle of July or August to the middle of the following May or June. In one case the eggs were carried 335 days, from July 1, 1890, to June 1, 1891. The yolk segments in about twenty-four hours after oviposition, and the embryo passes through the nauplius condition in ten days, and when from 26 to 28 days old the eye-pigment can be seen at the surface. The process of hatching for all the eggs borne by one female requires about a week.

The young on hatching are driven away by the fanning motion of the parent, and in May, June, and July they abound at the surface. During this time and until the fourth stage is reached immense numbers are devoured by surface-swimming fish and other animals. Herrick states that a survival of two in every 10,000 larvæ hatched would maintain the species at an equilibrium, and the destruction of the young under the present conditions of the fishery is probably even greater than this implies. After hatching, the young lobster passes through three stages before assuming the adult shape. In the first stage (Fig. 1), which lasts from one to four or five days, the length of the body being a little over a third of an inch (7.84 mm.), there are no abdominal appendages, and the two pairs of antennæ are short and thick. It now differs, however, from the larva (zoëa) of most shrimps and crabs, in having the full complement of thoracic legs. In the second stage, which lasts from two to five days, the length being 9.2



METAMORPHOSIS OF THE LOBSTER

1, 2, 3, Successive stages in larval development. 4. Young lobster in fully developed form. 5. An old adult.

mm., four pairs of swimmerets have appeared, and in the third stage the last pair of abdominal legs (uropods) arise. This stage lasts from two to eight days, its body being 11.1 mm. in length.

In Narragansett Bay (Wickford) the average period for hatching and reaching the fourth stage was a little over twelve days. The length of the fourth stage varies from 10 to 19 days; and during this period the larva is about half an inch (12.5 mm.) in length.

After the third molt, the young lobster or lobsterling (Fig. 4) assumes the shape and habits of the adult. Its body becomes heavier, the chelæ or hands of the first pair of feet are held straight out, and after living at the surface from six to eight weeks it sinks to the bottom, over which it crawls, and now the habits change. The young lobster, previously without fear and moving aimlessly about at the surface, now appears timid and retreats from danger, as does the adult; after reaching the bottom it travels toward the shore, and burrows in the sand at the bottom under stones, and takes every precaution to avoid its 'enemies.' Its natural food consists of minute crustaceans (copepods), and when food is scarce its own brethren, as it is atrociously cannibalistic.

Molting. The periodical shedding of the skin begins when the lobsterlings are two or three days old, and continues throughout life, the intervals between the successive castings of the shell growing longer with age. It molts from 14 to 17 times during the first year of its life. After sexual maturity ecdysis may not occur more than once a year; a 10½-inch lobster has molted from 25 to 26 times.

In the first molts, as in those succeeding, the process is the same, the old skin being split across the back, between the hinder edge of the shield or carapace and the abdomen; the carapace is raised up behind, the body being gradually drawn out through the gaping opening. In adult lobsters the withdrawal of the contents of the big claws is facilitated by the partial absorption of the lime in the shell of the narrow part of the base of the leg, so that the integument can be distended. The muscles at this time are greatly stretched, while their action is probably aided by the removal of water from the blood (Vitzou). During the process the stomach with the solid teeth, as well as the chitinous lining of the œsophagus and intestine, are cast off with the entire integument, including the finest hairs fringing the appendages. 'Shedders' are those with shells 'hard and dull,' previous to shedding or casting their shell, while soft-shelled lobsters are those which have recently exuviated. The process occupies but a few minutes, unless through weakness it is delayed. The period of shedding is, as in insects and other animals, a precarious one, and sometimes the animal dies during the process; both in the larval and adult stages growth or increase in size takes place while the new shell is being formed, and not immediately after ecdysis. (Herrick.) The increase in length of a lobster five and one-half inches long is one inch; in one 11¼ inches long one and one-fourth inches. The appearance of sudden growth is due to the absorption of water, not cellular growth. After molting it is several weeks before the new shell is as hard as the old one.

Rate of Growth. Our knowledge of the rate of growth of lobsters is not definite, but it is known that this rate varies enormously in different individuals reared in confinement in the same car under apparently the same conditions. Lobsterlings of the same age will measure from two and three-fourths to five inches. It is probable that the length of nine inches is not usually attained before the third year. The variations in growth are so great that "it will never be possible to tell the age of a large lobster from its length." A 10½-inch lobster is about five years old.

The problem of artificial propagation of the lobster will be solved, says Herrick, when means are devised by which the larvæ after hatching can be reared in large inclosures until the fifth or sixth stage, i.e. when three-quarters of an inch long, and able to take care of themselves.

Economic Importance. Of the annual yield of lobsters on the Atlantic Coast of the United States, 75 per cent. is from the waters of Maine. In 1880 the total yield of the United States was over 20 million pounds, and in 1889 this had risen to over 30 million, but that was the high-water mark of lobster production. Beginning with 1890 there has been a constant decrease in the amount, so that in 1898 it was only a little over 15 million pounds, and in 1900 still less. But while there has been this immense decrease in amount, the ever increasing demand has steadily raised the price, so that the value of the catch in 1898 was more than $1,300,000, while in 1889 it was about $860,000. In 1880 the Massachusetts catch was over 4,300,000 pounds, worth about $158,000, or about 3.6 cents per pound; in 1898 it had fallen to less than 1,700,000 pounds, worth less than $148,000, or about 8.7 cents per pound. Strenuous efforts have been made to prevent the extermination of the lobsters and to replenish the depleted areas, but so far with little success. All the New England States have laws protecting small lobsters, but these laws vary somewhat in the different States and are difficult to enforce. The principal feature of these laws is the determination of the minimum size of a marketable lobster, measured from the anterior end of the head (the so-called beak or rostrum) to the tip of the telson. None of the States permit the sale of lobsters less than nine inches in length, and the Massachusetts law places the limit at 10½ inches. In addition to protective legislation, attempts have been made to save the lobster-supply by artificial hatching and planting of the young. These efforts have been made chiefly by the United States Fish Commission, which has for some years past secured all the females 'in berry' which were obtainable, and, taking the eggs from them, has raised them under artificial conditions, as is done with fish-eggs. In 1900 more than 90,000,000 eggs were thus handled, from which over 80,000,000 young hatched. Unfortunately, however, these attempts have not met with any considerable success, as the young in the hatcheries have a very high death-rate, owing to the attacks of parasitic diatoms and bacteria. In 1901 and 1902, however, more encouraging results were obtained than ever before, through the use of large bolting-cloth 'cages,' in which the young were kept under as natural conditions as possible, while undergoing their metamorphosis. It is probably only a question of a few years before the Fish Commission will be able to maintain a reasonable supply of lobsters along the New England coast. Lobsters are caught chiefly by means of 'traps' made of laths and stout cord, into which they are beguiled by a piece of meat or fish. These traps are usually three or four feet long and capable of containing a number of lobsters. They are set in water ranging from five to six up to thirty fathoms or even more, and are visited every two or three days, if the weather permits. From the traps the lobsters are taken to floating cages, called cars, where they are kept until enough are gathered to warrant a shipment.

BIBLIOGRAPHY. Herrick, *The American Lobster: A Study of Its Habits and Development* (Washington, 1895); Bumpus, "The Embryology of the American Lobster," in *Journal of Morphology*, vol. v. (Chicago, 1891); *Annual Report of Commissioners of Inland Fisheries of Rhode Island* (Providence, R. I., 1900-02).

LOBWORM (from *lob*, probably from Welsh *llob*, dolt + *worm*), or LUGWORM. A chætopod worm (*Arenicola piscatorium*) used by British anglers as a bait. It lives in deep burrows hollowed out of the sand on the seashore, eating its way and passing the sand through the alimentary canal to extract whatever nutriment it may contain. It has a large head without eyes or jaws, a short proboscis, and thirteen pairs of gills, placed on each side of the middle of the body. It reaches a length of nearly a foot. Another species (*Arenicola custatum*) is found on the coast of Eastern North America, and others on the Pacific Coast.

LOCAL ACTION. See VOLTAIC CELL, or BATTERY.

LOCALITY (Lat. *localitas*, from *localis*, relating to place, from *locus*, place), PERCEPTION OF. If we are touched upon some part of the skin, we are conscious of a pressure, which is definitely localized. Similarly, the various objects in the field of vision possess a definite position. Again, we are able to describe the position of our limbs when they are entirely concealed from our view. In other words, pressure, color, and articular (joint) sensations are interpreted not only as cutaneous and articular pressures and colors, but also as pressures and colors at a particular place; they are somehow 'localized' in objective space. The problem of the perception of locality consists in a determination of the accuracy of localization, and an explanation of the conditions of its operation.

The accuracy of cutaneous localization is determined by touching the skin of the observer with a pencil. On the removal of the pencil, the observer endeavors, with closed eyes, to place his own pencil upon the stimulated spot. On the wrist, the average error of localization is from 5 to 10 mm. The accuracy of cutaneous localization within one and the same area (the 'limen of separation') is determined by the simultaneous application of two points upon the skin. (See EXTENSION; LIMEN.) The fineness of the visual perception of locality is measured by the minimal visual extent. The 'movement limen,' or the least noticeable difference in the position of a limb, depends upon the joint at which the movement takes place. The larger joints have, as a rule, smaller movement limens; the shoulder discriminates a difference in the position of the hand better than does the elbow; the hip is noticeably more sensitive than the ankle (.5° and 1° respectively).

Auditory impressions are also localized; but, since sounds do not themselves possess the spatial attribute, extension (q.v.), our judgment of the direction whence they come is effected indirectly by a process of 'associative supplementing.' (See ASSOCIATION OF IDEAS.) By experience, definite tactual and visual space positions become intimately associated to definite corresponding intensive differences in the auditory impressions of the two ears. For the perception of locality in the third dimension, see DISTANCE, or DEPTH. Consult: Kuelpe, *Outlines of Psychology*, translated (New York, 1895); Lotze, *Medizinische Psychologie* (Leipzig, 1852); Titchener, *An Outline of Psychology* (New York, 1899); Wundt, *Physiologische Psychologie* (Leipzig, 1893).

LOCAL OPTION. A system of local control of the liquor traffic. See TEMPERANCE.

LOCAL RANK. A temporary rank or grade bestowed in the British Army, during war, which permits an officer of junior absolute rank to perform duties of a much higher or relative rank. The rank is temporary, and holds good only in that army, commanded at the time by the commander-in-chief who grants it, but must be confirmed by the Secretary of State for War.

LOCARNO, lō-kär'nō (Ger. *Luggarus*). A town in the Canton of Ticino, Switzerland, on the north shore of Lake Maggiore (q.v.) at the mouth of the Maggia. It is connected by a branch railway with the main line of the Saint Gotthard system and by regular steamboat service in summer with Arona (q.v.). The pilgrimage Church of Madonna del Sasso contains paintings of interest, and on September 8th occurs the great festival of the Nativity of the Virgin. Locarno, mentioned in history as early as 789, came into the possession of Milan in 1340, and was ceded to the Swiss in 1512. Its development was arrested by the expulsion of the Protestants in 1553. The population (mostly Catholic Italians) is almost 3200.

LOCHABER (lŏk-ä'bẽr) **NO MORE.** A song by Allan Ramsay, first published in his *Tea Table Miscellany*, a collection of English and Scotch songs. The air, for which a Scotch origin has been claimed, is probably Irish, and appears as "The Irish Inne" in Thomas Duffet's *New Poems, Songs, Prologues, and Epilogues* (London, 1676). It was also known as "King James's March to Dublin." The melody is attributed in Bunting's *Ancient Music of Ireland* to Myles Reilly of Killincarra, about 1635. See *Our Familiar Songs* (New York, 1901).

LOCHES, lōsh. An ancient town in the Department of Indre-et-Loire, France, situated on the left bank of the Indre, 29 miles by rail southeast of Tours (Map: France, G 4). Its chief point of interest centres in its old castle, built by Charles VII., and now used for administrative purposes. One of the towers still contains the iron cages which held many famous prisoners during the reign of Louis XI. The castle also contains the tomb of Agnes Sorel, the mistress of Charles VII. The town hall, a Renaissance building of the sixteenth century, and the collegiate Church of Saint Ours (tenth to twelfth century) are also noteworthy. Loches produces some textiles and trades in agricultural products.

Loches is supposed to occupy the site of a Roman settlement. It was held by the English for about fifty years in the fourteenth century. Population, in 1891, 5132; in 1901, 5161.

LOCHIEL, lŏᴋ-ēl′. A Highland chief of Scotland. See CAMERON, DONALD.

LOCHIEL'S WARNING. A poem by Thomas Campbell, the subject of which is Donald, son of Sir Evan Cameron of Lochiel.

LOCHINVAR, lŏᴋ′ĭn-vär′. A well-known ballad, and the name of its hero, in Scott's *Marmion*. The young Highlander rescues his sweetheart, who is about to be married to another, by claiming a last dance, at the end of which he swings the lady to the saddle of his waiting horse and carries her off before the astonished company can interfere.

LOCH KATRINE, kăt′rĭn. See KATRINE, LOCH.

LOCHLEVEN, lŏᴋ-lē′ven. An oval lake in Kinross-shire, Scotland, about three and three-quarters miles long and two miles wide (Map: Scotland, C 3). It is famous for the ruins of its ancient castle built on one of seven islands, half a mile from the shore, a place of great historical interest and the prison of Queen Mary (1567-68). The lake receives the waters of several streams and is much frequented for its excellent trout-fishing. Consult Burns-Begg, *History of Lochleven Castle* (Kinross, 1877).

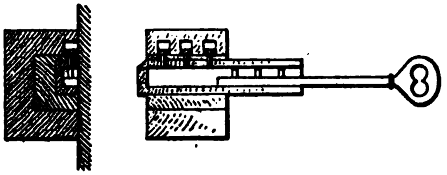
LOCHLEVEN CASTLE. See LOCHLEVEN.

LOCH LOMOND, lō′mond. See LOMOND LOCH.

LOCHNER, lōɢ′nẽr, STEPHAN (?-1451). A German painter, born at Meersburg, in the Bishopric of Constance. He appears in the records as having been chosen councilor of the Guild of Painters at Cologne in 1447, and again in 1450. His chief work—and that of the Cologne School—is the triptych known as the Kölner Dombild. Other extant paintings by him are two tablets, each representing three saints, an "Entombment," a "Last Judgment," and the "Madonna in the Rose-Arbor," in the Wallraf-Richartz Museum of Cologne; and in the Germanic Museum of Nuremberg, "Christ and Six Saints."

LOCK (AS. *lōc*, from *lūcan*, OHG. *lūkhan*, Goth. *ga-lūkan*, to close; ultimately connected with Lith. *lúzti*, Skt. *ruj*, to break). A contrivance for securely fastening a door or lid by means of an inclosed bolt which is shot back and forth by a key or other device. The bolt is usually guarded by an obstacle, and locks may be divided into two general classes according to the character of the obstacle which must be overcome by the key. (1) *Warded locks* are those in which the obstacle consists of fixed wards or ridges within the lock. (2) *Tumbler locks* are those in which the obstacles are movable pins or levers. In either class of locks the bolt can be actuated only by a properly shaped key, whose indentations correspond to the ridges or will raise the pins to the proper height.

HISTORICAL DEVELOPMENT. In his paper on *Locks and Safes* (see bibliography), Mr. Chubb traces, in the following manner, the development of locks. The bolt, or essential part of a lock, was probably developed from the bar or cross-beam with which early peoples secured their doors. This bar was held in sockets or staples fixed on the door, and was secured by means of a pin dropped through a hole in the staple and bar. From this original bar-fastening four different types of locks were developed by primitive men.



SECTIONS SHOWING THE PRINCIPLE OF THE EARLY EGYPTIAN LOCK.

The Egyptian placed the bar on the outside of the door and reached the pin which held it through a hole in the bar itself. In other words, the bar, which was shortened into a bolt, was hollow for a part of the distance. Instead of one pin, several pins were used. The fully developed Egyptian lock consists of a case, which is nailed to the door. Through the case passes a large wooden bolt, the end of which enters the staple, while the opposite end is left exposed. In the lower part of the bolt is a square groove, which has certain round or square holes. When the bolt is pushed home into the staple, these holes come exactly under corresponding little cavities in the case, in each of which is placed an upright wooden pin with a knob, which prevents its falling too low; these little pins consequently fall into the holes in the bolt when it is pushed far enough, and the door is locked. In order to unlock it, a bar of wood is passed into the groove in the bolt, and on the bar there are the same number of pins of wood placed upright as there are holes in the bolt and loose pins in the chambers of the case; and these upright pins are placed so as to correspond exactly in size and position to the holes; therefore, when the pins reach the holes, they slip into them and push up the loose pins into their respective cavities, and the bolt is then easily pulled back by means of the bar or key. This form of lock, exactly like that made 4000 years ago, is still used in Egypt. The later Roman lock was based upon it, and it contains the principle of the modern pin-tumbler lock. It is easy to see how, in the simplest form of this lock, while the bolt was still a hollow beam, the key was the human arm and the projections on it were the five fingers of the human hand used to press up the pins. In order to reach the beam from the other side of the door, to insert the key, a hole was made in the door through which to pass the hand.

In another class of locks the pins are lifted from the holes in the bolt—the bolt being still on the outside of the door—by means of a hole in the staple. The hole is horizontal, the pins are square in section and are notched on their sides, permitting the key to pass into position before they are lifted; the key is usually flat with little side projections which engage the pins. The bolt is drawn by hand after the key has disengaged the pins.

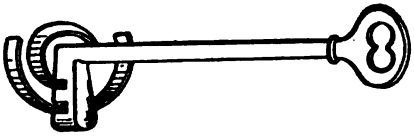
In the third type of primitive lock the bolt is on the inside of the door and the pin which holds it does not need to be concealed. The key is a sickle-shaped piece of iron, which is passed through a hole in the door and pushes up the pin on the inside. Just how these keys were manipulated and how closely they were fitted is uncertain. They must have been widely used, for they are found in abundance in different parts of Europe, especially France and Germany.

The fourth type was used in the Roman padlocks, and is still used in China. The bolt is kept out by the projection of a spring or springs which spread out against the sides of the staple. The springs are merely flexible barbs attached to the bolt, and the key is a flattish one with prongs at the end to engage the springs. The key is passed through a hole in the door and turned and pulled. This compresses the springs so the bolt can be pushed back by the key.

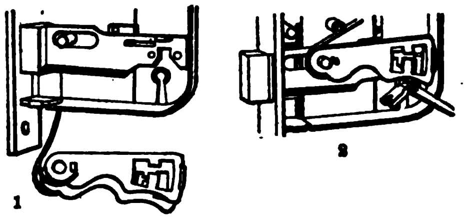
In the fully developed fixed lock of the Romans the parts are of metal; the bolt is much shortened and is concealed behind an ornamental plate. The pins which hold the bolt vary in shape and are pressed down by a flat spring. The key, which reaches the bolt through a hole in the front plate, has projections or teeth in it corresponding to the pins. The key presses up the pins and frees the bolt, so that it can slide exactly as in the Egyptian lock.

During the Middle Ages very complicated and ingenious locks of various kinds were made, and much artistic taste was expended upon their ornamentation. Such locks, however, were not adapted to general use, and they were found only on the caskets of the wealthy.

Warded Locks. The origin of warded locks is unknown, but is undoubtedly of early date, for they seem to have been used by the Etruscans. A century ago they were considered very safe, and were made in most complicated and ingenious forms. It was the only lock generally employed up to the beginning of the last century, even for important purposes, and this kind of lock is still in very common use. It consists of a bolt of metal, to which a spring is attached. The bolt is moved backward or forward by means of a key, which by raising the bolt compresses the spring in the slot, through which it works, and so lets it pass on until out of the range of the key's action. As the key turns on a pivot, its action is regulated by the length of the wards and the depth of a curve cut in the under side of the bolt. In order to prevent any key of the same size opening all such locks, little ridges of iron are placed in circles or parts of circles, and grooves are cut in the keys so as to correspond with them; hence, only the key which has openings or wards which will allow the ridges to pass through them can be used. The bolt has at the end opposite to that which enters the staple a small piece slit, bent outward, and tempered hard; this forms the spring; below are two notches, divided by a curved piece of the bolt; there is another notch, which, if the key enters and is turned round it, draws the bolt forward or backward in locking or unlocking, and the spring makes the end of the bolt either drop into one of the notches or rise up the curve, according to the distance to which it is pulled.

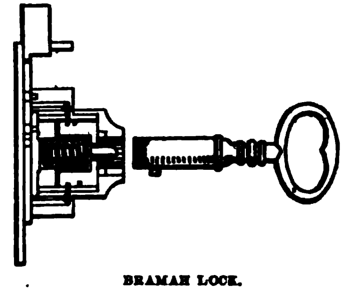

EARLY FORM OF WARDS FROM WARD LOCK.

The *tumbler lock* is an advance upon the lock just described. In its simplest form the bolt has neither the stringpiece nor the notches and curves on the under side, but it has two notches on the upper side, which are exactly as far apart as the distance moved by the bolt in locking or unlocking. Behind the bolt is the tumbler, a small plate moving on a pivot, and having projecting from its face a small square pin, which when the bolt is locked or unlocked falls exactly into one or the other of the small notches. There is in the key a notch which corresponds to the outline of the tumbler. This acts upon the tumbler when the key is turned, and raises it so as to lift the pin out of the notch in the bolt, and allow the latter to be moved freely forward until the other notch comes under the pin, when the latter falls into and immediately stops its farther progress, and the action of the key must be reversed in order to relieve it again. This very simple application of the tumbler is sufficient to explain the principle, which may be and is varied to an almost endless extent. Its resemblance to its prototype, the Egyptian lock, with pins dropping into holes in a bolt and raised by a key, is apparent. In another class of locks, first used in mediæval times, the keys are pipe-shaped, to slide onto a fixed pin in the lock, like the old-fashioned watch-key. Such locks are now used chiefly in cabinet-work. Chubb's lock (originally patented in 1818) carries out the tumbler principle most fully, the bolt itself being only a series of tumblers, with a notch on the key for each. Bramah's lock, patented in 1788, is very different in principle from those mentioned, consisting of a number of movable slides or interior bolts working in an internal cylinder of the lock, and regulated by the pressure upward or downward of the key acting on a spiral spring. For ordinary purposes it is very secure.

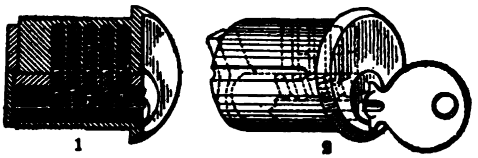


VULCAN TUMBLER LOCK.

(1) Bolt in place, tumbler removed, and shown below.
(2) Tumbler in place with key being turned to lift it.


BRAMAH LOCK.

The 'parantoptic' (inspection-defying) lock of Day & Newell, often called the Hobb's lock, on account of the success of that gentleman in introducing it, is an ingenious and complicated piece of mechanism which was widely used for some time after its introduction about 1850, and was considered absolutely safe. It was picked, however, by Linus Yale, Jr., the inventor of the celebrated Yale lock. The *Yale lock*, with its characteristic flat key, was invented about 1860, and is a development of the old Egyptian pin-lock. The lock consists of a barrel, which turns in a cylinder in order to move the bolt. The barrel is prevented from being turned by five *divided* pin tumblers, which move up and down in little cylindrical rooms and pass through the lower part of the case and through the bolt, so their lower edges come in contact with the key as it is inserted. The upper part of each pin is forced down by a little spiral spring, which is placed above it in the pin-room. This in turn presses down the lower part of the pin, so that, when the key is not in the lock, the pins hold the bolt. The pins are unequally divided, and the upper surface of the key is so shaped as to raise the pins correspondingly, as the division between each upper and lower pin is on the line between the barrel and cylinder. When the key is inserted the pins are gradually raised until all those in the cylinder are raised exactly to the line between the barrel and the cylinder, while the lower portions of the pins are raised to the same point, permitting the barrel to be easily turned, so as to throw the bolt. Should a false key be inserted the steps on its upper surface would not correspond to the division of the pins, but some would be raised too high, projecting from the barrel into the cylinder, and some would not be raised high enough, and thus the bolt would remain locked. Recent improvements in the form of the key render the lock still more secure. These consist of a peculiar form of cross-section, both of the key and its keyway, whereby these parts are interlocked throughout their length and access to the tumblers made so difficult as to render the lock practically 'unpickable.' Perhaps the most familiar form of Yale lock is the *latch-lock*. Like all latch-locks, this one works automatically when the door is closed. It opens on the inside with a handle, and on the outside with a key. The latch is an entirely modern addition to the door-lock, which enables it to be locked or opened from the inside without a key.



YALE LOCK.

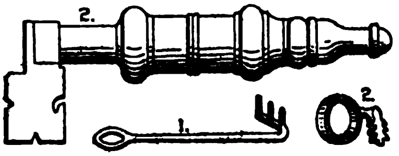
(1) Without key. (2) Key inserted, pins brought into line, and bolt being turned.

Classification of Locks. Locks in a general way may be classified according to the use for which they are intended, as follows: (1) Front-door locks and vestibule latches, for entrances; (2) sliding-door locks; (3) night-latches; (4) store-door locks; (5) dead-locks, in which no knob is used, the key action alone being required; (6) hotel locks, which are so arranged that when locked from the inside they cannot be unlocked from the outside of the door. Mortise locks are mortised into the frame of the door, while rim locks are secured to its face. Master-keyed locks are so constructed that a single master-key can unlock a whole group or series, but there is also an individual key for each lock, which will operate no other lock in the series.

Dial Locks. An important class of locks are what are called permutation and dial locks, used upon safes. One of the principal devices in them is the employment of a number of wheels, placed near together, on an axis on which they move independently. These wheels do not interfere with the motion of each other, except when certain pins are brought in contact, the pins being movable at the will of the person adjusting the lock. In this way one having knowledge of the combination may arrange the wheels so that certain slots in their peripheries will not coincide, and cannot be made to coincide, by any one not in possession of the arrangement. The person having such knowledge may, however, readily place the slots into line so that a key may be passed through them, or a handle operating the bolt mechanism released and the latter moved. An ingeniously arranged dial is placed on the outside of the safe door, through which a bolt passes attached in the lock to a wheel. This fixed wheel can be turned one way or another, and, being provided with a pin, the first of the movable wheels may be turned so that its slot will correspond to any number on the dial. The first movable wheel, being also provided with a pin upon its disk, is made to turn the second wheel to a certain position, and so on to the last wheel, when, the slots being all brought into line, the handle operating the bolts is free to turn. There are a great many varieties of these locks, each possessing various advantages. As burglars often compel the person having the knowledge of the combination of a lock to reveal the secret, it is often the practice to provide bank-vault locks with a clockwork attachment by means of which the bolt is liberated at a certain hour, until which time nobody, not even the person possessing a knowledge of the combination, can open the lock. As powerful explosives have been inserted through the keyholes of locks, a keyless time lock has been devised for greater security. A case containing two very powerful springs is placed on the inside of the door and operated by a key on the outside. One of these springs is released as the door is shut and throws the bolts into a locked position. The second spring is acted on by a clock movement, and at whatever hour the clock is set the spring is released and throws the bolts into their unlocked position. The owner, when closing his safe at night, sets the clock to run off guard at whatever hour he wishes, say nine o'clock the following morning. They may be set to run seventy-two hours.

Keys vary in shape according to the locks to which they belong. In olden times keys were ponderous affairs, which were borne on the shoulder instead of being tucked away in the pocket. They were often several feet long. The ordinary key consists of three parts—the bow, or upper end; the bit, or lock end; and the connecting shank. When the cuts of the bit are on the side or edge they indicate a tumbler or lever lock; when the cuts are on the top or bottom the key belongs to a ward lock. When the shank is tubular it indicates a lock which can be operated from one side only, such as are used for drawers and chests, for door-lock keys have solid shanks. Cylinder locks have flat keys without a bit, or rather with a shank which is a prolonged bit;

the new Yale locks have what is known as a paracentric instead of a flat key; flat keys, without a wing or bit, are now made for warded and lever tumbler locks.



(1) EARLY EGYPTIAN AND (2) POMPEIAN KEYS.

Bibliography. For the development of early locks, consult a paper by Harry W. Chubb, entitled "Locks and Safes," in the *Journal of the Society of Arts* (London, 1893). Consult, also: Price, *Treatise on Locks* (London, 1856, out of print); chapter on "Locks" in Blackall, *Builders' Hardware* (New York, 1899). See Safes and Safe-Deposit Vaults.

LOCK (in canal structure). See Canal, and Dam.

LOCK, or **LOCKE,** Matthew (c.1630-77). An English composer. He was born in Exeter, and received instruction in the rudiments of music from Wake, organist of Exeter Cathedral. When Charles II. made his entry into London after the Restoration, Lock was employed to write the music for the occasion, and was afterwards appointed composer to the King. He was the first musician of England to compose for the stage, and wrote some rather famous instrumental music for *The Tempest* and *Macbeth.*

LOCKE, David Ross (1833-88). An American humorist, born in New York, known by his assumed name of 'Petroleum V. Nasby.' Locke first attracted attention by letters published in the Findlay *Jeffersonian* in 1860 with the signature 'Rev. Petroleum Vesuvius Nasby.' They purported to emanate from a poor and ignorant Democrat with a yearning for the postmastership and whisky, and an admiration for the institution of slavery. The character was dramatically developed in a series of amusing incidents. The letters were soon transferred to the *Toledo Blade,* of which Locke became editor and in part proprietor. They were of great assistance to the war administration of Lincoln by meeting the criticism of the Peace Democrats of the North. Later, their sting was directed against President Johnson and his 'swinging 'round the circle.' Locke became a popular lecturer, and in 1871 moved to New York and finally returned to Toledo. He published in book form *Divers Views, Opinions, and Prophecies of Yours Truly* (1865); *Swingin' 'Round the Kirkle* (1866); *Ekkoes from Kentucky* (1867); and *The Struggles—Social, Financial, and Political—of P. V. Nasby* (1872), in which the best of his humorous work was gathered.

LOCKE, John (1632-1704). An English philosopher, born at Wrington, near Bristol, on August 29, 1632. His father was an attorney and also served as captain in the Parliamentary army during the Civil War. Locke was sent for his education to Westminster School, where he continued till 1652, when he became a student of Christ Church, Oxford. After his graduation he took pupils, and from 1661 to 1664 he lectured in Oxford on Greek, rhetoric, and moral philosophy. In 1665 he went to Cleves as secretary to the British envoy, but soon returned to his studies at Oxford, where he devoted himself to medicine for a while. In 1666 he made the acquaintance of Lord Ashley, afterwards Earl of Shaftesbury, and on his invitation went to live at his house and became his family physician. It was in Lord Ashley's house that he had his attention directed to the importance of undertaking an investigation of the limits of human understanding. This investigation resulted many years after in the publication of his famous *Essay.* In 1672, when Shaftesbury became Lord Chancellor, Locke was appointed secretary of presentations, a post which he afterwards exchanged for that of secretary to the Council of Trade. He was employed to draw up a constitution for the American Province of Carolina, but the constitution was never adopted. In 1675 he took up his residence at Montpellier for the benefit of his health. Here he formed the acquaintance of the Earl of Pembroke, to whom his *Essay* is dedicated. In 1679 he rejoined the Earl of Shaftesbury in England; but in 1682 the Earl fled to Holland, to avoid a prosecution for high treason. Although there is no evidence to warrant the belief that Locke was implicated in any treasonable practice, he was under surveillance, and in the following year followed the Earl to Holland, and so far shared with him the hostility of the Government of Charles as to have his name erased, by royal mandate, from the list of students of Christ Church. Even in Holland he was demanded of the States-General by the English envoy; but he contrived to conceal himself under the assumed name of Dr. Van der Linden, till the English Court ceased to trouble itself on his account. In 1687 his *Essay Concerning Humane Understanding,* begun seventeen years before, was finished; and an abridgment of it was published in French (1688) by his friend Le Clerc, in his *Bibliothèque Universelle,* in which Locke had published two years before his *New Method of Making Commonplace Books.* In 1688, the year of the Revolution, he came back to England in the fleet that conveyed the Princess of Orange. He soon obtained from the new Government the situation of commissioner of appeals, worth £200 a year. He took a lively interest in the cause of toleration, and in maintaining the principles of the Revolution. In 1689 appeared his first letter on 'Toleration.' In 1690 his *Essay Concerning Humane Understanding* was published, and met with a rapid and extensive celebrity, although Locke himself received only £30 for the copyright of the first edition; and also a second letter on 'Toleration,' and his well-known *Treatises on Government.* In 1691 he was engaged upon the momentous question of the restoration of the coinage, and published tracts on the subject. In 1693 was published *Some Thoughts of Education.* In 1695 King William appointed him member of a new council of trade at a salary of £1000. *The Reasonableness of Christianity* had been written to promote William's favorite scheme of a comprehension of all the Christian sects in one national Church. In this work he argued the necessity of identifying Christianity, not with a belief in mysteries such as the incarnation and the atonement, but with the gospel of love. He maintained a controversy in defense of this book; he had another controversy in defense of the *Essay*, against Stillingfleet, Bishop of Worcester. His feeble health compelled him to resign his office in June, 1700, and he spent the remainder of his life at Oates, in Essex, at the seat of Sir Francis Masham, who had taken Locke into his home in 1691. His last years were very much occupied with the study of the Scriptures, on which he wrote several dissertations, which, with his little work entitled *On the Conduct of the Understanding*, were published after his death. He died October 28, 1704.

Great as were Locke's services to his country, and to the cause of civil and religious liberty, his fame rests on the *Essay Concerning Humane Understanding*, which marks an epoch in the history of philosophy. His purpose was to inquire into the powers of the human understanding, with a view to find out what things it was fitted to grapple with, and where it must fail, so as to make the mind of man "more cautious in meddling with things exceeding its comprehension, and disposed to stop when it is at the utmost extent of its tether." He institutes a preliminary inquiry in the first book as to the existence of innate ideas, theoretical and practical, on which the philosophical world has been much divided. (See COMMON SENSE, PHILOSOPHY OF.) Locke urges against the existence of these supposed innate conceptions or intuitions of the mind the fact that there is no truth universally accepted by mankind. Having thus repudiated the intuitive sources of our knowledge or ideas, he is bound to show how we come by them in the course of our experience. Our experience being twofold, external and internal, we have two classes of ideas—those of sensation and those of reflection. He has, therefore, to trace the recognized conceptions of the mind to one or other of these sources. Many of our notions are obviously derived from experience, as colors, sounds, etc.; but some have been disputed, more especially ideas of space, time, infinity, power, substance, cause, moral good and evil; and Locke discusses these at length, by way of tracing them to the same origin. This is the subject of book ii., entitled "Of Ideas." Book iii. is on language considered as an instrument of truth, and contains much valuable material. Book iv. is on the nature, limits, and reality of our knowledge, including the nature of demonstrative truth, the existence of God, the provinces of faith and reason, and the nature of error.

In his views on government, Locke was a disciple of Hobbes, but he was not slavish in his discipleship. He believed with Hobbes that government is the result of an original contract, but the state of nature preceding the establishment of government he did not believe to be a state of war. Right existed before the foundation of society. Society is a means to the better enjoyment of natural rights; Locke distinguishes in government the three functions of legislation, execution, and adjudication. Of these the legislative function is supreme, but even over this stands the sovereign will of the people. When the people enforce their will against the government, there is no rebellion. They are acting within their rights. In ethics he was a hedonist. Good and bad are equivalent to pleasure and pain or their causes. Moral good is accordance with the law imposed by an authority which rewards us with pleasure for obedience and punishes us with pain for disobedience. The law-imposing authority may be divine or human.

Locke's collected works have often been published from 1714 on. A convenient edition of his philosophical works is Saint John's, London, 1854, followed by many subsequent issues. The best edition of the *Essay* is Fraser's (Oxford, 1894). For biography, see King, *The Life of John Locke* (London, 1829); Fox Bourne, *The Life of John Locke* (London and New York, 1876); T. Fowler, *John Locke* (London, 1880); A. C. Fraser, *Locke* (Edinburgh, 1890). The last two works give also popular accounts of his philosophy. For a fuller bibliography, see Ueberweg-Heinze, *Grundriss der Geschichte der Philosophie* (8th ed., Berlin, 1896). A convenient compendium of Locke's philosophical views is found in Russell, *The Philosophy of Locke* (New York, 1891).

LOCKE, JOHN (1792-1856). An American physicist and inventor, born at Freiburg, Maine. He was educated at Bethel Academy and at Yale, and then entered the navy as a surgeon. Later he settled in the Middle West, and became well known as a geologist, botanist, and inventor of scientific instruments.

LOCK'ER-LAMP'SON, FREDERICK (1821-95). An English writer, born May 29, 1821, in Greenwich Hospital. For many years he was a précis-writer in the Admiralty, Whitehall, but after middle life he devoted himself to travel, society, and literature, and became well known in 1857 by a collection of graceful society verse, entitled *London Lyrics*. He subsequently published an anthology, *Lyra Elegantiarum* (1867; new ed. 1891), and a volume of miscellanies, *Patchwork* (1879). Locker married in 1850 Lady Charlotte Bruce, a daughter to Lord Elgin, and after her death the only daughter of Sir Curtis Lampson (1874), from whom he took the name Lampson. He died at Rowfant, May 30, 1895. Consult his autobiography, *My Confidences* (London, 1896).

LOCKHART, lŏk'härt. A town and the county-seat of Caldwell County, Tex., 30 miles south of Austin, on the San Antonio and Aransas Pass, and the Missouri, Kansas and Texas railroads (Map: Texas, F 5). It controls the trade of a cotton, grain, and live-stock region, and has cotton-gins and a compress, a cottonseed-oil mill, lumber-yards, wagon-works, a soap-factory, etc. Population, in 1890, 1233; in 1900, 2306.

LOCKHART, JOHN GIBSON (1794-1854). The son-in-law and biographer of Walter Scott. He was the son of Rev. John Lockhart, and was born in the manse of Cambusnethan, Scotland, July 14, 1794. Two years later his father became minister of the College Kirk in Glasgow. From the high school and the University of Glasgow, young Lockhart proceeded to Balliol College, Oxford, where he graduated in 1813. He afterwards studied law at Edinburgh and became an advocate at the Scottish bar (1816). Already interested in literature, he made a German tour in 1817, visiting Goethe at Weimar. In April of the same year *Blackwood's Magazine* was founded, and Lockhart soon became one of its chief contributors. In the October number he assailed Coleridge and Leigh Hunt, the leader of 'the Cockney school' of poets; then had a hand in the buffoonery of "The Chaldee Manuscript," and made some good translations of Spanish ballads (collected, 1823). In 1819 he published *Peter's Letters to His Kinsfolk*, a satirical description of Edinburgh society. In 1818 he had made the acquaintance of Sir Walter Scott, whose daughter Sophia he married in 1820. Four novels now followed: *Valerius*, a Roman tale, placed in the time of Trajan (1821); *Adam Blair* (1822); *Reginald Dalton* (1823); and *Matthew Wald* (1824). *Adam Blair* is a powerful story on the theme to be treated later by Hawthorne in *The Scarlet Letter*. In 1825 Lockhart became editor of the *Quarterly Review*, and in 1843 auditor of the Duchy of Lancaster. In the interval he wrote *Life of Burns* (1828); *History of Napoleon* (1832); and the work by which he is best known, the *Life of Scott* (1836-38). After Boswell's *Johnson*, this is the most admirable biography in the English language. Lockhart's last years were saddened by domestic troubles. He retired from the *Quarterly* (1853), resigned the auditorship of Lancaster (1854), and died at Abbotsford, November 25, 1854. Consult the *Life and Letters of Lockhart*, by Lang (London, 1897).

LOCK HAVEN. A city and the county-seat of Clinton County, Pa., 28 miles west-southwest of Williamsport, on the west branch of the Susquehanna River, and on branches of the Pennsylvania Railroad and the Beech Creek Railroad (Map: Pennsylvania, D 2). It is the seat of the State Central Normal School, and has a subscription library of 5000 volumes, a hospital, and a fine court-house. The city is surrounded by an agricultural and lumbering country, and its industries include several planing-mills, foundries, tanneries, fire-brick and sewer-pipe works, a large silk-mill, and manufactures of furniture, paper, cigars, cigar-boxes, beer, etc. There are municipal water-works. Lock Haven was settled in 1769, and was incorporated as a town in 1833, as a borough in 1844, and as a city in 1870. Population, in 1890, 7358; in 1900, 7210.

LOCKJAW. An infectious bacterial disease. See Tetanus.

LOCKOUT. The withdrawal of employment from a body of men who refuse to accede to the employer's conditions. The lockout is usually distinguished from the strike on the ground that in the lockout it is the employer who directly causes the stoppage of operations, while in the strike the initiative lies with the men. The distinction is wholly superficial, since the workers, by demands that seem to the employer unreasonable, may really be responsible for the lockout, just as the employer, by the imposition of onerous conditions, may force a strike. For this reason most students of the labor problem are convinced that no purpose is served by the distinction which is usually drawn between the two phenomena. For statistics of lockouts, see Strikes. Consult *Report of the Industrial Commission*, vol. xvii. (Washington, 1901).

LOCKPORT. A city and the county-seat of Niagara County, N. Y., 26 miles north by east of Buffalo, on the Erie Canal, and on the New York Central and Hudson River and the Erie railroads (Map: New York, B 2). The canal, here crossed by the New York Central Railroad bridge, 500 feet in length and 60 feet above water, passes over the continuation of the Niagara escarpment, 60 feet in height at this point, by means of a double tier of five locks, each with a lift of 12 feet. The city has extensive quarries of limestone and sandstone, a large trade in grain and fruit, and manufactories of Holly water-works machinery, milling and wood-working machinery, indurated fibre, pulp and paper, aluminum, glass, flour, brooms, cotton batting, carriages, rolling-mill products, etc. The government is administered, under a charter revised in 1900, by a mayor, elected every two years, who controls appointments to the boards of health, fire, police, water, assessors, and plumbing, and by a unicameral council, composed of the executive and ten aldermen, four of the aldermen being elected at large. Administrative officials other than those mentioned are chosen by popular election. The city owns and operates the water-works. Population, in 1890, 16,038; in 1900, 16,581. A settlement sprang up here when the Erie Canal was opened (1825). The village was incorporated in 1829, and the city in 1865. Consult Pool, *Landmarks of Niagara County* (Syracuse, 1897).

LOCKROY, lō'krwä' (properly Simon), Edouard Etienne Antoine (1838—). A French journalist and politician. He was the son of the dramatist Joseph Philippe Simon Lockroy (1803-91), and was born in Paris. In 1860 he went to Italy and fought under Garibaldi in the Sicilian campaign. Soon afterwards he accompanied Renan as secretary on his travels through Palestine (1860-64). Upon his return to Paris he began his journalistic career, and contributed to the *Figaro* and the *Diable à Quatre*. His articles in *Le Rappel* resulted in his being imprisoned for four months (1869). He was a member of the National Assembly in 1871. During the troubles of the Commune he was arrested and was again imprisoned for a few months. A year later, when editor of *Le Peuple Souvrain*, he was imprisoned for his duel with Paul de Cassagnac, and again for an article in *La Libération du Territoire* (1873). In the same year he was elected to the National Assembly as a member of the Extreme Left. He was Minister of Commerce and Industry (1886-87) and Minister of Public Instruction (1888), and he directed the formation of the Universal Exposition of 1889. He was twice vice-president of the Chamber (1889 and 1893) as head of the Radical Party, and afterwards Minister of Marine (1895-96). Some of his numerous contributions to the journals and magazines have been gathered into the following volumes: *A bas le progrès* (1870); *La Commune et l'Assemblée* (1871); *L'ile révoltée* (1877); and *Ahmed le boucher* (1888). He also edited the memoirs of his grandmother, Mme. Jullien, as the *Journal d'une bourgeoise pendant la Révolution, 1791-93* (1881).

LOCKROY, Joseph Philippe Simon (1803-91). A French dramatic author, born at Turin. He received an excellent literary education, went on the stage as a youth, and was a successful actor. His first attempts in playwriting were in collaboration with Scribe, in *La marraine* (1827), and *Catherine II.* (1831); his next with A. Bourgeois and Arnould, in *L'impératrice et la juive* (1834); *La vieillesse d'un grand roi* (1837); and *La jeunesse dorée* (1849). He was credited with a considerable share in Dumas's drama *La conscience* (1855), and was joint author of *La fée Carabosse* (Lyric Theatre, 1859), and the comic operas *Ondine* (Lyric,

1863) and *Suzanne* (Opéra Comique, 1879). Many of his own pieces were performed at the Opéra Comique, such as *Le bon garçon* (1837), and at the Lyric, *Les dragons de Villars* (1856) and *La reine Topaze* (1856). He also composed genre scenes and vaudevilles.

LOCKS′LEY HALL. A poem by Tennyson (1842). The despair and anger of the hero at the loss of his betrothed through greed of gold rises at the close of the poem to a nobler and larger view of life.

LOCK′WOOD, Belva Ann (Bennett) (1830—). An American lawyer and reformer. She was born at Royalton, N. Y., graduated at Genesee College, Lima, N. Y., and after teaching school for eleven years studied law and was admitted to the bar of the District of Columbia in 1873. In 1879 she was admitted to practice before the Supreme Court, under a law admitting women, which she had been instrumental in getting passed. She lectured frequently and became prominent in peace, woman suffrage, and temperance movements. In 1884 and in 1888 she was nominated for President by the Equal Rights Party, and in 1896 represented the United States under a commission from the Secretary of State at the Congress of Charities and Corrections held at Geneva, Switzerland. She was married in 1848 to Uriah H. McNall, who died five years later, and in 1868 to Dr. Ezekiel Lockwood.

LOCKWOOD, James Booth (1852-84). An American Arctic explorer, born at Annapolis, Md., where his father, Gen. H. H. Lockwood (q.v.), was a professor in the United States Naval Academy. He was educated at Bethlehem, Pa., and at Saint John's College, Annapolis, was a surveyor for several years, and in October, 1873, received a commission as second lieutenant in the Regular Army. For the next seven years he served in the West, being detailed on Government surveys and the construction of telegraph lines. In 1881 he accompanied Adolphus W. Greely (q.v.) as second in command on his expedition to Lady Franklin Bay, and his magnetic observations were among the most important results achieved by the expedition. On April 3, 1882, with eight men on sledges, he started on his famous trip to the North Greenland coast, reaching Cape Britannia on May 5, and thence proceeding northward over unknown land and ice, and reaching, on May 13th, the land called in his honor Lockwood Island, in latitude 83° 24′, the nearest point to the pole which had been reached up to that time. He returned to his companions at Fort Conger on June 17th, having traveled a distance of 1069 miles in sixty days, and added 125 miles of coastline to the map of Greenland. He attempted in the following year to attain a more northerly point, but failed. Later, in 1883, with Brainard, he crossed Grinnell Land, but the privations of the hard winter of 1883-84 told on his health, and he died at Cape Sabine in the following April. Consult: Lanman, *Farthest North* (New York, 1885), and the official *Reports on the Lady Franklin Bay Expedition* (Washington, 1887).

LOCKWOOD, Henry Hayes (1814-99). An American soldier and authority on military tactics. He was born in Kent County, Del., graduated at West Point in 1836, served in the Seminole War as a lieutenant in the Second Artillery, and resigned his commission in the next year. In 1841 he was made professor of mathematics at the United States Naval Academy, where from 1851 to 1866 he held the professorship of field artillery and infantry tactics. He entered the Union Army in the Civil War as colonel of the First Delaware Infantry, was commissioned a brigadier-general of volunteers on August 8, 1861, and served in the defenses of the lower Potomac. He commanded a brigade at Gettysburg, and in the winter of 1863-64 was commander of the Middle Department with headquarters at Baltimore. Later he took part in the Richmond campaign. He was the author of *Manual of Naval Batteries* (1852), and *Exercises in Small Arms and Field Artillery* (1852).

LOCKYER, lŏk′yẽr, Sir Joseph Norman (1836—). An English astronomer and physicist, born at Rugby. He studied in England and on the Continent. In 1857 he was appointed clerk at the War Office, which position he retained for several years, devoting his leisure to the study of astronomy. In 1870 he was appointed secretary of the Duke of Devonshire's commission on scientific instruction and the advancement of science, and in 1871 assistant commissioner. He was transferred to the Science and Art Department at South Kensington in 1875. From 1870 to 1900 he was the leader of the English Government Eclipse Expeditions. On the foundation of the Royal College, he was appointed professor of astronomical physics and director of the Solar Physical Observatory at South Kensington. His contributions to the knowledge of the physical condition of the heavenly bodies are valuable. He also carried out spectroscopical researches on the chemistry of the sun, for which he was granted the Rumford medal by the Royal Society in 1874. He discovered, simultaneously with Dr. Janssen, the possibility of successful observations of the solar prominences in broad daylight by means of the spectroscope. His name appears together with that of Dr. Janssen on a medal struck by the French Government in 1872 in commemoration of the discovery. He also advanced the theory of the origin of cosmical systems, according to which the various orders of the heavenly bodies are alike composed of meteorites. The assumption that there exists a relation between the number of sun-spots and the rainfall on the earth is due to his investigations. Among his publications may be mentioned: *Why the Earth's Chemistry Is As It Is* (1866); *Elementary Lessons in Astronomy* (1868-94); *Report to the Committee on Solar Physics on the Basic Lines Common to Spots and Prominences* (1880); *Questions on Astronomy* (1870); *Contributions to Solar Physics* (1873); *Star-Gazing, Past and Present* (1877); *Studies in Spectrum Analysis* (1878); *The Movement of the Earth* (1887); *The Chemistry of the Sun* (1887); *The Meteoritic Hypotheses* (1890); *The Dawn of Astronomy* (1894); *The Sun's Place in Nature* (1897); *Recent and Common Eclipses* (1897); *Inorganic Evolution* (1900). He also made numerous contributions to the *Proceedings* of the Royal and the Royal Astronomical Societies.

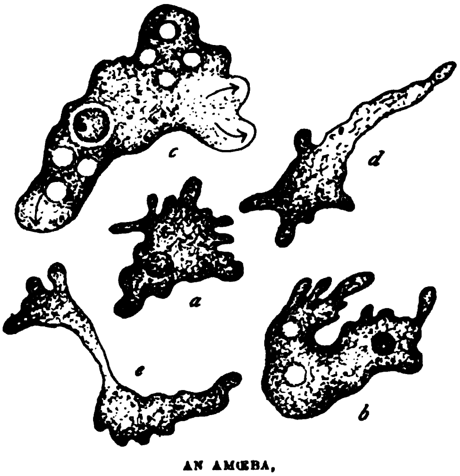
LOCLE, lô′kl′, Le. A town of the Canton of Neuchâtel, Switzerland, situated on the French frontier, five miles southwest of Chaux-de-Fonds (Map: Switzerland, A 1). The town has been rebuilt since a fire in 1833, and contains among its educational buildings an imposing college, a watchmaking institute, a mechanical school, various secondary and industrial schools, besides possessing industrial, scientific, and art museums, and a library. The streets are lighted by electricity. The chief industry is watchmaking, for which the town has long been famed. Population, in 1900, 12,600.

LOCO (Sp., crazy) **DISEASE.** A disease of sheep, horses, and occasionally cattle, caused by certain species of Astragalus, a genus of the natural order Leguminosæ, popularly known as loco or crazy weeds, and widely distributed over the grazing ranges of the Rocky Mountains, where they occasion extensive losses. The most common species are Astragalus mollissimus and Astragalus spicatus. The disease may be called a pernicious habit, which is readily acquired by healthy animals through imitation of locoed animals, consisting in the persistent search for and almost exclusive feeding upon loco-weeds. Animals that have once contracted the habit and are confined in fields or pastures free from loco-weeds in order to effect a cure soon return to the old habit when turned out to range. They are therefore of no value as range stock. The first effects are stimulant, but continued use produces opposite results. The disease may appear in an acute or a chronic form. In the acute form the animal manifests signs of vertigo, moves about in circles, champs the jaws, and seems to be more or less deaf and blind. Death may occur within three days. In the chronic form the animal may linger for months or even years, losing flesh, exhibiting muscular incoördination and various nervous symptoms, finally becoming unable to walk, and dying of starvation or exhaustion. Locoed sheep sometimes shed the fleece. Locoed horses generally stand by themselves on the range; usually move about very little during the later stages; sometimes they do not drink oftener than once in two or three weeks; frequently they are unsteady and stiff and unduly frightened by ordinary objects; and when driven may run away at any time without apparent reason. No medicinal treatment for loco disease has been discovered, but potassium permanganate may be administered in acute cases to oxidize and destroy the poisonous alkaloid contained in loco-weeds. Locoed sheep should be confined in feeding corrals and fattened upon alfalfa and roots for market; locoed horses may develop, under judicious feeding, into valuable work-animals. All animals addicted to eating loco-weeds should be separated from their companions in order to check the spread of the habit.

LOCO-WEED.

LOCO-FOCO (from Lat. *locus*, place + *focus*, hearth, fire; formed on the analogy of *locomotive*, ignorantly supposed to mean 'self-moving'). In American political history, the name applied originally to the radical or Equal Rights faction of the Democratic Party in New York State, in 1835-37, but afterwards used by the Whigs to designate the Democratic Party generally, throughout the nation. The system of granting bank charters in New York by special legislation for each case had given rise not only to favoritism and partisanship, but to bribery, purchase, and open fraud. The activity in chartering new banks in 1834-35, caused by the certainty that the United States Bank would not be rechartered, increased the scandal, and at last aroused some of the New York City Democrats to action. During the summer of 1835 several meetings were held for the purpose of effecting an organization, which, at the approaching election, should support only candidates declaring their opposition to special bank legislation and its attendant evils. A mass meeting of this faction was held at Tammany Hall on October 29, 1835, to act upon the report of a special nominating committee. The regular or Tammany Democrats, entering by the back stairs, attempted to control the meeting, but, finding the opposition too strong, turned out the gas and retired, leaving the reformers in darkness. The victors, however, were well provided with candles, which they lighted with *loco-foco*, or friction matches, and proceeded to act on the nominations. The incident of the lights was seized upon by the Democratic press, which derisively dubbed the anti-monopolists 'Loco-Focos.' In January, 1836, a county convention was held at which the new party took the name of the Equal Rights Party, and adopted a statement of rights, in which it declared among other things that no legislature had the right to exempt corporations by special charters from the operation of any law, or to grant them special privileges, and that paper money was a vicious circulating medium and gold and silver the only safe and constitutional currency. In the spring elections of 1836 the party nominated candidates for mayor and aldermen, who polled over 3000 votes. On September 15th following a State convention was held at Utica which nominated candidates for Governor and Lieutenant-Governor. In New York City, Congressional, Senatorial, and Assembly nominations were made. The Whigs indorsed four of the nominees and they were elected. In the spring city elections of 1837 the party held the balance of power, the vote cast for their mayoralty candidate throwing the city government into Whig hands. A second State convention held at Utica in September, 1837, framed a new State constitution, one of the features of which was the provision for an elective judiciary. President Van Buren's message to the special session of Congress that met in that same month, by adopting almost the identical grounds on financial matters held by the Equal Rights Party, did much to bring the mass of the reformers back into the Democratic ranks, a result which was further hastened by the refusal of some of the Whig-Loco-Foco fusion candidates to live up to their pledges. The party made no more nominations, although the name 'Loco-Foco' continued to be applied to the whole Democratic Party for ten years longer. The influence of the movement, however, was felt in New York State politics in the passage of the safety-fund banking law in 1838, in the prohibition of special legislation for banks, and in the provision for an elective judiciary in the new Constitution of 1846. Consult: Byrdsall, *History of the Loco-Foco or Equal Rights Party* (New York, 1842); Hammond, *History of Political Parties in the State of New York* (Syracuse, 1852).

LOCOMOTION (from Lat. *locus*, place + *motio*, motion, from *movere*, to move). In plants, the free spontaneous movements from place to place that occur in lower forms and in the so-called zoöspores of higher forms. Swimming movement occurs in many of the lower algæ and fungi, in zoöspores of higher algæ, and in sperms of mosses and ferns. It is found as far up the scale of plant life as the gymnosperms, Ginkgo, Cycas, and Zamia, in which the male cells, which correspond physiologically to the sperms of lower forms, are freely motile. A creeping (amœboid) movement over a moist surface occurs in the masses of naked protoplasm (plasmodia) which constitute the vegetative stage of slime-molds. Swimming movements are usually due to the rapid lashing of long or short protoplasmic processes (cilia) which propel the organism through the water. They are very minute and often numerous, the entire surface of some zoöspores (e.g. those of Vaucheria) being covered with them. Sometimes, however, there are four, three, two, or only one. In this case they are longer than when more numerous. A single large cilium is often termed a flagellum.



AN AMŒBA,

Sketched at intervals of half a minute. Compare particularly *d* and *e*. The smaller end of *e* will probably next move into the larger, thus effecting translation.

The mechanism of the movement of diatoms is not yet fully known. Some forms creep by means of protrusions of the protoplasm through the slit (raphe) which traverses the siliceous wall lengthwise. Amœboid movements are brought about by a flowing motion of the naked protoplasm which composes the organism. One or more processes form on one side of the body and elongate and the plasma flows slowly away from other regions to enter these processes. If this be continued in one direction the whole protoplasmic mass may creep over the substratum, material being thrust out in front and drawn in from behind. It has been suggested that this form of movement is due to variations in the surface tension of the protoplasmic mass. These variations may be due to unequal oxidation at different points on the surface. But nothing is known with certainty in this regard. It may be that the rotation of the protoplasm within certain walled cells is a form of amœboid movement.

Certain other forms of free movement which are sometimes confused with true locomotion are not the result of inherent energy at all, but are merely the effects of external forces. Such are the migrations of the wind-blown tumble-weeds, and of all winged seeds, pollen-grains, etc. Also the movements of certain seeds provided with hygroscopic awns are purely physical. Alternate wetting and drying cause these awns to change their form and position and thus to displace the seeds or to force them into the earth. See MOVEMENT; ROTATION.

LOCOMOTIVE (from Lat. *locus*, place + ML. *motivus*, moving, from Lat. *movere*, to move, Skt. *miv*, to push). A steam-engine and boiler mounted on wheels and so connected with them as to be capable of self-propulsion along a railway track; specifically, a railway engine. By extension the term has come to be applied to other motors than steam-engines, which are similarly mounted and self-propelling, as compressed-air locomotives, electric locomotives, etc. The locomotive as a railway engine operated by steam is alone considered in this article. See COMPRESSED-AIR LOCOMOTIVE; ELECTRIC RAILWAYS.

EARLY HISTORY AND DEVELOPMENT. The locomotive engine was first developed for use on common roads (see AUTOMOBILE); it was not until 1804 that it was applied to railway operation by Richard Trevithick. Little is definitely known of the Trevithick locomotive first used on the Merthyr-Tydvil Railway beyond the fact that it had a return tubular boiler, a tall smoke-stack, into which the cylinder steam exhausted, and a cylinder eight inches in diameter, and four and one-half foot stroke. Another point which deserves to be noticed is that Trevithick recognized the sufficiency of the adhesion between a plain cylindrical wheel and a smooth rail for securing the necessary tractive power, but he recognized also that under certain conditions this adhesion would be insufficient and provided for toothed wheels and rails to be used in such cases. Trevithick's locomotive made no more than one or two trips on the Merthyr-Tydvil Railway. Commercially it was regarded as a failure. In hope of something better growing out of it, however, Mr. Blackett of the Wylam Colliery, near Newcastle-on-Tyne, wrote to Trevithick in Cornwall in 1809 with reference to the construction of another engine. Trevithick at first refused to consider the matter, but apparently reconsidered his decision; for in 1811 he sent a locomotive to Newcastle-on-Tyne, which for some reason was laid aside, and finally set to drive an iron-foundry. In the same year (1811) Matthew Murray built for John Blenkinsop, the proprietor of the Middleton Colliery, near Leeds, a locomotive in which the steam-cylinders operated a toothed wheel which engaged with a toothed rail laid alongside one of the track-rails. In Murray's locomotive the boiler was cylindrical and horizontal with slightly convex ends, and had a single internal flue in which the fire-grate was placed at one end and out of which the chimney rose at the other. There were two steam-cylinders located on top of the boiler and projecting downward into the boiler. The cylinders were upright and double-acting. Each piston-rod was so connected with a pair of cranks, one on each side of the engine, as to drive a toothed wheel, the two wheels thus driven by the two pistons being made to gear with a larger toothed wheel which meshed with the toothed rail. The engine was carried on four smooth wheels in the manner of an ordinary road-wagon. Murray's engine is stated to have hauled a load of 30 loaded coal-wagons weighing 94 tons at a speed of three and one-half miles per hour on a level, and to have hauled 15 tons up a grade of 1 foot in 15 feet. While Murray's engine was being operated regularly between Middleton and Leeds, Mr. Blackett of Wylam with his engineer, William Hedley, was at work on a locomotive based on the one purchased from Trevithick as noted above. Mr. Hedley made first a series of experiments to determine the sufficiency for railway operation of the adhesion between smooth wheels and smooth rails. These experiments proving satisfactory, he designed and built his first engine in 1813. It had a cast-iron boiler, with a single internal flue, a cylinder six inches in diameter, and a fly-wheel. The engine worked by the adhesion of its driving wheels upon smooth rails. The boiler was deficient in steaming power and serious inconvenience was felt from the want of a second cylinder. The results were such, however, as to encourage Mr. Blackett to commission Mr. Hedley to make another and better engine. This engine had a wrought-iron boiler with a return flue, the chimney being placed at the same end as the fire-box. Two vertical cylinders were employed, one on each side of the engine. The piston-rods of these cylinders connected with beams the opposite ends of which were hinged. and the connecting-rods were connected to the beams midway between the piston-rod connections and the hinges and extended downward to cranks operating toothed wheels which, by means of a chain of gear-wheels, operated the two pairs of wheels upon which the engine was carried. In 1815 another locomotive was built by Hedley similar to the one just described, but larger and heavier and having eight wheels instead of four wheels (Fig. 2).

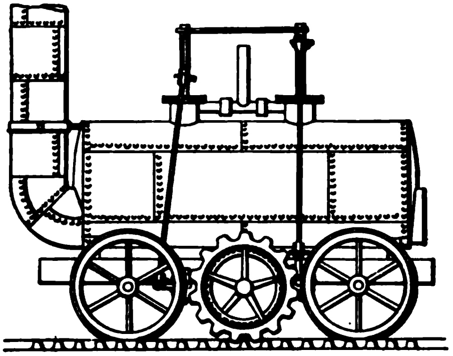


FIG. 1. MURRAY'S LOCOMOTIVE FOR BLENKINSOP'S RAILWAY, 1811.

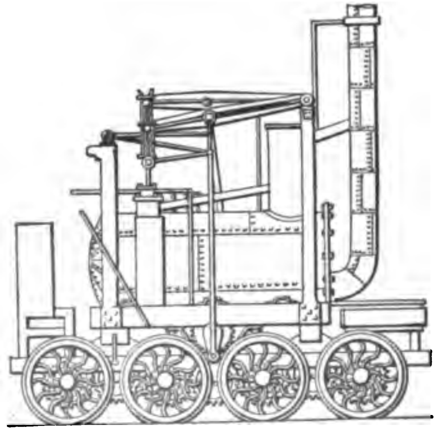


FIG. 2. HEDLEY'S ENGINE, 1815.

The Hedley engines presented two notable advances over previous locomotives. The first was the use of a return tubular boiler and the second was the adoption of a smokestack of small diameter in which the exhaust cylinder steam could produce an effective draught. Almost before the practicability of Hedley's engines had been proved on the Wylam Railway, George Stephenson had recommended the adoption of locomotives by the managers of the Killingworth Colliery. It was finally decided to construct a locomotive, and the work was done in the colliery machine-shops after the designs and under the direction of Stephenson. The engine which was finally turned out of the shops was supported on four wheels, and had a wrought-iron horizontal boiler 8 feet long and 34 inches in diameter, with a single internal flue 20 inches in diameter having a grate in one end and a 20-inch stack leading out of the other end. There were two vertical 8 × 24-inch cylinders, the motion of whose pistons was conveyed to the four driving wheels by an arrangement almost identical with that used by Hedley. The engine was greatly inferior to both Murray's and Hedley's engines previously described. Stephenson's first engine was completed on July 25, 1814, and the following year he completed a second. This engine was notable because of the fact that the pistons were linked directly to cranks on the driving wheels, and the toothed wheels and chain of gearing previously employed were abandoned. Briefly described, this engine had a horizontal cylindrical boiler with a vertical steam-cylinder mounted on its top at each end. The piston-rod of each cylinder was connected to the centre of a horizontal cross-head extending transversely across the boiler and long enough so that connecting-rods attached to its two ends and extending downward to the cranks on the wheels would clear the boiler on each side. The two pairs of driving wheels were connected together by an endless sprocket chain to insure uniformity and coincidence of rotation.

In later engines Stephenson substituted rigid side rods for the sprocket chain and supported a portion of the weight of the engine upon pistons contained in vertical cylinders beneath and communicating freely with the interior of the boiler, the pistons being made to press downward upon the bearings of the axles.

The engines built by Stephenson for the Stockton and Darlington Railway were substantially of the construction just described. They were not very satisfactory machines, and Timothy Hackworth, the locomotive engineer of this road, undertook to improve upon them. His engine, the *Royal George,* was completed in 1827. The boiler was a plain cylinder 13 feet long and 4 feet 4 inches in diameter and had a return flue like the Hedley engines used on the Wylam Railway. There were six coupled wheels four feet in diameter, and the cylinders, which were placed at the end opposite the fire-door and stack, were so arranged that they overhung the sides of the boiler sufficiently for the downward-projecting piston-rods to clear it and to connect through connecting-rods with cranks on the rear pair of wheels. These rear drivers were rigid, but the others had springs. The *Royal George* had a cistern into which a portion of the exhaust steam could be turned to heat the feed-water: it also had short-stroke force-pumps worked by eccentrics, adjustable springs instead of weights upon the safety valves, a single lever reversing gear, and a blast-pipe by which the exhaust cylinder steam created a draught in the smokestack.

Nothing further of importance respecting the mechanical development remains to be noted until the trials instituted by the Liverpool and Manchester Railway in 1829, which are noted in the article on RAILWAYS. Four locomotives were submitted to undergo this trial and three of them were actually tested. The result of the trial was the award of the prize to the *Rocket,* submitted by George Stephenson in the name of his son Robert Stephenson. The *Rocket* (Fig. 3) was a four-wheel engine supported on springs, and, with a supply of water in the boiler, weighed 4 tons 5 hundredweight. The boiler was a horizontal cylindrical vessel 6 feet long and 3 feet 4 inches in diameter, traversed by 25 copper tubes 3 inches in diameter, through which the gaseous products of combustion were conveyed from a 'fire-box' at one end to a tall stack 12 inches in diameter at the other end. The fire-grate was 3 feet wide and 2 feet long in the direction of the boiler, and the fire-box was 3 feet deep and surrounded by a 3-inch water-space which communicated with the boiler proper by means of two external pipes. The cylinders, placed in an inclined position, were fastened to the outside of the boiler near the fire-box, the connecting-rods working upon crank-pins in the driving wheels, which were placed under the front end of the engine. The cylinders were 8 inches in diameter and had a stroke of 16½ inches; the driving wheels were 4 feet 8½ inches in diameter. The exhaust steam from each cylinder was carried through a pipe and turned upward into the stack. As the result of the success of the *Rocket,* whose speed exceeded all expectations, the managers of the Liverpool and Manchester Railway ordered several locomotives from the Stephensons. These engines were, however, larger and heavier than the *Rocket,* some of them having 10 × 16 inch, and others 11 × 16 inch cylinders, with 5-foot driving wheels and weighing six and one-half and seven tons. The arrangement of the cylinders was substantially the same as on the *Rocket,* but they were less inclined. The tubes in the boiler were increased to from 90 to 92 in number and were reduced in diameter to two inches. A smoke-box was also added to the boiler.

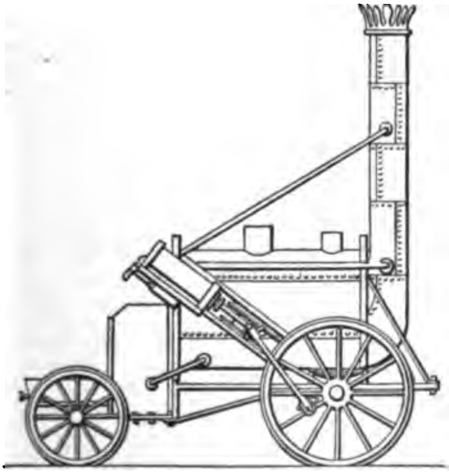


FIG. 3. STEPHENSON'S ROCKET, 1829.

Before taking up the next series of steps in the mechanical development of the locomotive a moment's attention should be given to the performances of the early engines so far mentioned. These are shown in the accompanying table, taken from Zerah Colburn's *Locomotive Engineering* (London, 1871).

The steep inclination of the cylinders of the Stephenson engines caused the machine to rise and sink on the springs at every double stroke, and at moderately high speeds the unsteadiness thus occasioned was considerable. Timothy Hackworth seems to have been the first to conceive of the plan of avoiding this trouble by placing the cylinders horizontal. On March 3, 1830, he made plans for a horizontal cylinder engine for the Stockton and Darlington Railway, and laid them before the Stephensons, with orders to build an engine in conformity with them. These plans called for an engine with the following essential characteristics: The boiler was a horizontal cylinder with a single internal flue carrying a grate in one end, and the wheels were four in number, five feet in diameter and coupled. A copper steam-dome was placed on the boiler, and from this feature the engine received its name of the *Globe.* The forward axle was the driving axle, and it had two cranks between or inside the wheels. The cylinders were horizontal and were located underneath the rear end of the boiler between or inside the rear wheels. Defined briefly as to its cylinders, the *Globe* was a horizontal, inside cylinder, direct connected locomotive. The *Globe,* according to Zerah Colburn, was not delivered to the Stockton and Darlington Railway until after the Stephensons, by whom it was being built, had embodied its arrangement of cylinders and driving axle in the *Planet,* the first inside-cylinder engine made by that firm for the Liverpool and Manchester Railway. This engine left Newcastle on September 3, 1830, and was placed in operation on October 4, DIMENSIONS, ETC., OF EARLY ENGLISH LOCOMOTIVES

NAME	Railway	Date	Weight exclusive of tender, tons	Diameter of cylinders, inches	Length of stroke, inches	Diameter of driving wheels, ft. ins.	Area of fire grate, square ft.
Trevithick's......	Merthyr-Tydvil....................	1804	......	(one) 8	54		
Murray's..............	Middleton..............................	1811	......				
Murray's..............	Middleton..............................	1829	6½				
Hedley's...............	Wylam..................................	1813					
Stephenson's.........	Killingworth..........................	1814	......	(two) 8	24	3 0	6
Stephenson's.........	Killingworth..........................	1815	7½	(two) 8	24	3 0	7
Royal George........	Stockton and Darlington......	1827	11	(two) 11	20	4 0	
Royal George........	Stockton and Darlington......	1829	11	(two) 11	20	4 0	
Rocket..................	Liverpool and Manchester....	1829	4½	(two) 8	16½	4 8½	6
Samparell *..........	Liverpool and Manchester....	1829	4¾	(two) 7	18	4 6	10
Novelty †.............	Liverpool and Manchester....	1829	2 7-10	(two) 6	12	4 2	1.8
Phoenix ‡.............	Liverpool and Manchester....	......	......	(two) 11	16	5 0	6
Arrow ‡................	Liverpool and Manchester....	......	......	(two) 10	16	5 0	6

NAME	Railway	Date	Area of fire-box surface, sq. ft.	Area of flue or tube surface	Gross load drawn exclusive of engine	Speed in miles per hour	Consumption of fuel per hour, lbs.	Evaporation of water per hour, cu. ft.
Trevithick's	Merthyr-Tydvil....................	1804	......	....	15	5		
Murray's..............	Middleton..............................	1811	......	....	94	3½		
Murray's..............	Middleton..............................	1829	......	....	140	3		
Hedley's...............	Wylam..................................	1813						
Stephenson's........	Killingworth..........................	1814	10	20	40	5		
Stephenson's.........	Killingworth..........................	1815	11½	29¾	50	5	coal 293	16
Royal George........	Stockton and Darlington......	1827	......	....	130	5		
Royal George........	Stockton and Darlington......	1829	......	....	72	11		
Rocket..................	Liverpool and Manchester.....	1829	20	117¾	12¾	13.8	coke 214	18¼
Sanspareil*	Liverpool and Manchester.....	1829	15.7	74.6	14¼	13.8		
Novelty †..............	Liverpool and Manchester.....	1829	9½	33	8	15		
Phoenix ‡..............	Liverpool and Manchester.....	......	20	306	41½	10	coke 323	34.4
Arrow ‡................	Liverpool and Manchester.....	......	20	289	35½	12	coke 221	44

* Submitted in Liverpool and Manchester trials by T. Hackworth. † Submitted in Liverpool and Manchester trials by John Ericsson. ‡ Built for Liverpool and Manchester Ry. by Stephensons as result of success of *Rocket*.

1830. Before the *Planet* had left Newcastle, however, Edward Bary, of Liverpool, had placed an inside cylinder engine designed by Mr. Kennedy, his shop foreman and subsequent partner, on the Liverpool and Manchester Railway. This engine, known as the *Liverpool*, had four wheels of the then great diameter of six feet. The cylinders were placed nearly horizontally and side by side; the boiler contained a number of convoluted flues, and the fire was urged by bellows worked from beneath the tender. The *Liverpool* commenced working on July 22, 1830. Of the three locomotives the *Globe*, the *Liverpool*, and the *Planet*, the last was the only one which combined horizontal inside cylinders, a cranked axle, and a multitubular boiler. The *Planet* was the prototype of the modern English locomotive, and in it the locomotive engine assumed a definite and permanent form. It was the standard model of the locomotives built by the Stephensons for many years, and also the model from which both British and American engineers copied freely and minutely. The main dimensions of the *Planet* were as follows: Weight, loaded, 9 tons; weight of tender, 4 tons; cylinders, 11 × 16 inches; diameter of driving wheels, 5 feet; diameter of leading wheels, 3 feet; length of boiler, 6 feet; diameter of boiler, 3 feet; fire-box heating surface, 37¼ square feet; number of tubes, 129; diameter of tubes, 1⅝ inches; tube heating surface, 370 square feet; net load hauled, 76 tons at a maximum speed of 15½ miles per hour. To summarize briefly, the three inventors who stand highest in the long roll of those who have developed the railway locomotive are Richard Trevithick, Timothy Hackworth, and George Stephenson. As a true inventor Trevithick ranks first; as a noted authority well remarks, "it was he who first broke through the trammels of Watt's system of construction and low, if not negative pressure; it was he who first employed the internal fire-place and internal heating surface; he was the first to create or promote a chimney draught by means of exhaust steam—the first to employ a horizontal cylinder and cranked axle, and to propose two such cylinders with the cranks at right angles to each other, the first to surround the cylinder with hot air, the first to draw a load by the adhesion of a smooth wheel upon a smooth iron bar, and the first to make and work a railway engine." Notwithstanding this note of its merits, Trevithick's genius was of an impracticable kind, and the practical engineering and business ability of Hackworth and Stephenson were necessary to develop the locomotive into a practical commercial machine. Hackworth stamped a character upon the structure of the locomotive engine which it still retains, while it is as the champion in that great contest against the ignorance and prejudice of the public which finally made the steam locomotive the unchallenged means of motive power for railways, that the name of George Stephenson must ever shine above the others.

The development of the locomotive engine in America dates from 1830, when the *Best Friend*, designed by Adam Hall, and built at the West Point Foundry in New York City, was put at work on the Baltimore and Ohio Railroad. Locomotives had been previously used on American railways, but they were imported from England, while the *Best Friend* was of American construction and design. The *Best Friend* had a vertical tubular boiler, carried at one end of a horizontal platform or frame, while the cylinders were carried at the other end, and the four wheels occupied the space between the boiler and the cylinders. The cylinders were inclined, 8 inches in diameter, and 16 inches stroke, and coupled direct to the rear axle. The two pairs of wheels were coupled together by side rods. This locomotive was destroyed after working about six months by a boiler explosion. In 1831 the West Point Foundry built a second engine, which was put at work on the Mohawk and Hudson Railroad, now a part of the New York Central and Hudson River Railroad. This second engine, known as the *De Witt Clinton*, was very similar in general form to the first, but possessed several improvements. During the same year an engine resembling very closely the Hedley engines previously described was built by Phineas Davis, of York, Pa., and Peter Cooper, of New York. Mr. Cooper's particular contribution to the engine was a vertical tubular boiler. None of these locomotives was the equal of the English engines then in use, and they marked no changes from English practice. In 1832, however, an engine was built at the West Point Foundry after designs by John B. Jarvis, which had a pair of driving wheels and a four-wheeled swiveling truck. Ross Winans had already, in the previous year (1831), introduced the passenger-car with swiveling trucks. The engine was designed to burn anthracite coal; the English locomotives all burned bituminous coal. Other engines were built by William T. James of New York, Col. Stephen H. Long, of Philadelphia, Davis & Gartner, of York, Pa., and Robert L. Stevens, of Hoboken, N. J.

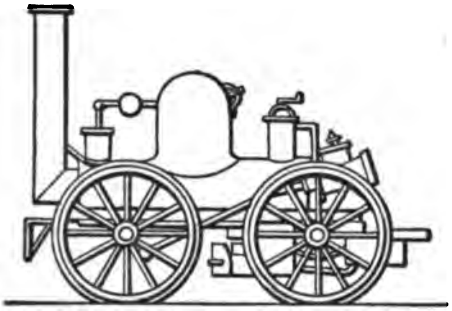


FIG. 4. DE WITT CLINTON, 1831.

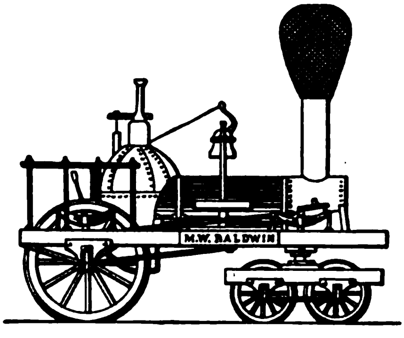


FIG. 5. BALDWIN'S ENGINE, 1833.

The origin of locomotive-building as a commercial industry in America dates from 1832, when William Norris started a shop in Philadelphia, and from 1834, when Mathias Baldwin started a shop in the same city. Baldwin's first engine designed for actual railway operation was a close model of the English engines of the *Planet* class, but his second engine had a pair of driving wheels and a four-wheeled swiveling leading truck. The Norris engines were of the same general form as the second Baldwin locomotive. Some few of the engines turned out by these two builders were outside connected, that is, the piston-rods and connecting-rods were outside the driving wheels, but this construction did not become common practice until later. A novel type of engine, known as the 'grasshopper' engine, was produced about this time, having a vertical boiler and vertical cylinders, the piston being connected to a beam pivoted at one end and having at the other a connecting-rod connecting by crank and gears with the driving wheels. One of these engines weighed 6½ tons each, and was operated at a speed of twelve to fifteen miles an hour, doing the work of forty-two horses at a cost of $16 for the round trip, as compared with $33 for horse haulage. In 1834 the Locks and Canals Company, of Lowell, Mass., and in 1840 Hinckley & Drury, of Boston, Mass., began building locomotives. The engines built by the latter firm were all outside-connected machines. The builders and inventors who have been named produced among them all the various features typical of the modern locomotive. It was necessarily given such form that it would work safely and efficiently on rough, ill-ballasted, and often sharply winding tracks; and it soon became evident that the two pairs of coupled driving wheels, the forward swiveling truck, the system of equalizing suspension bars by which the weight is distributed fairly among all the wheels, whatever the position of the engine or whatever the irregularity of the track, were essential features of a locomotive working under such conditions. Time, moreover, has shown that they were also excellent features for smooth roads.

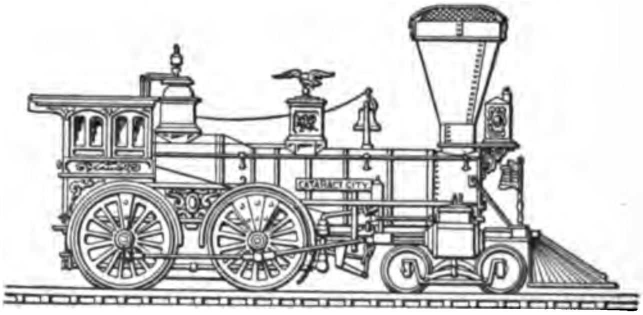


FIG. 6. AMERICAN PASSENGER ENGINE, 1855.

The 'cow-catcher,' or pilot, placed in front to remove obstacles from the track, the bell, and the whistle were also American developments. The severity of the winter storms compelled the adoption of the 'cab,' and the use of wood for fuel led to the invention of the spark-arrester for wood-burning engines. The heavy grades of American roads led to the development of the sand-box as a requisite appliance.

CONSTRUCTION. Structurally a locomotive consists of a frame, the boiler and engine supported by it, and the running gear on which the whole travels along the track. Since the boiler at present sets the limit of power that a locomotive is capable of exerting, a description of modern locomotive construction may properly begin with this important part.

The *boilers* used upon locomotives are of a distinct type. They consist of an approximately cylindrical barrel or shell filled with longitudinal tubes and having an internal fire-box or furnace at one end and an attached smoke-box and stack at the opposite end. Fig. 7 is a longitudinal section of such a boiler with the attached parts indicated. The fire-box is surrounded on all sides except the bottom by the boiler water, and to support and maintain in place its top and four sides they have to be attached to the adjacent sheets of the boiler shell by stay-bolts. *Stay-bolts* are of various forms. An ordinary form is a round steel rod threaded at its ends, one end being screwed into a hole in the fire-box sheet and the other end into a hole in the adjacent sheet, and the two ends then riveted over or headed. Usually a small hole is drilled into the fire-box end of each stay-bolt, which serves as a warning, if the bolt becomes broken, by allowing a small stream of water to escape into the fire-box. The form of stay-bolt just described is known as a rigid stay-bolt. Flexible stay-bolts are also employed; these are hinged at one end, usually by means of a ball and socket joint, so that unequal expansion of the two sheets connected is possible without bending the stay. To support the top or crown sheet of the fire-box, two means are employed; one is to use long radial stays from the crown sheet to the boiler shell, and the other is to suspend from the shell by means of sling stays a number of crown bars which are stay-bolted to the crown sheet. Various combinations of these methods of support and of the several forms of stay-bolts are also employed. The staying of the crown and side and end sheets of locomotive fire-boxes is one of the most difficult and important details of locomotive boiler construction. The enormous warping effect of the fire-box sheet due to the fierce fire on one side and the water on the other side would soon destroy the sheets were they not securely bolted in position. The stays are consequently put in very close together and only the best material and workmanship is countenanced. Even when all these precautions are taken much trouble results from broken and leaky stay-bolts and from warped sheets.

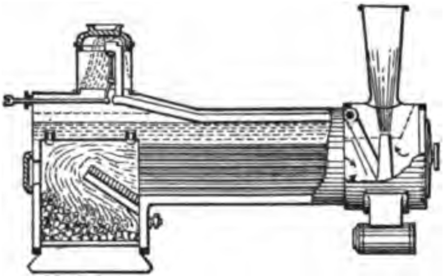


FIG. 7. LONGITUDINAL SECTION OF LOCOMOTIVE BOILER.

The boiler shell is nearly always made of sheet steel; the tubes are sometimes made of steel, but are more often of wrought iron. Wrought iron is the preferred material for stay-bolts also. In outer form locomotive boilers are either straight-top boilers or wagon-top boilers. The straight-top boiler is one whose shell is a rectilinear surface from front to rear; a wagon-top boiler (Fig. 7) is one whose shell is cylindrical for part of its length from the front end and then bulges up and outward to a considerably larger diameter at the rear end. Some forms of boiler have received special names. The *Belpaire* boiler is one in which the crown sheet and side sheets are rectilinear planes instead of curved surfaces. The *Lentz* boiler has a cylindrical corrugated fire-box and requires no stay-bolts. A *Wootten* boiler has a wide shallow fire-box with the grates above the tops of the driving wheels; it is designed for burning anthracite, which requires more grate area than does bituminous coal.

Generally speaking, the locomotive *fire-box* is rectangular in plan and is roughly of balloon shape in vertical transverse section. The top sheet is called the crown sheet, those at the two sides are called side sheets, those at the two ends are called the front and rear tube sheets. Formerly it was the practice to make the fire-box narrow, so that it would sit between the engine frames, but the more common practice now is to set it on top of the frames and thus obtain greater width and length. The bottom of the fire-box is formed by a grate. *Grates* are of various forms. For burning wood a stationary grate, consisting of a heavy cast-iron plate perforated by narrow slats arranged in rows, is used. For burning bituminous coal movable or rocking grates are invariably employed. For anthracite coal similar rocking grates are used, and use is also made of water-grates. In water-grates the grate-bars are hollow tubes connecting with the front and rear water-legs of the fire-box and are consequently kept filled with water. Generally all the grate-bars are not water-tubes, but a few of these are alternated with solid bars which can be moved to shake and dump the fire. Many engines are now constructed for burning oil fuel, and the fire-boxes are adapted to its use with but few changes.

Brick arches are commonly used in locomotive fire-boxes to improve the combustion and the distribution of the heat through the tubes. They consist of an arch of fire-brick whose front end connects with the tube sheet just below the lowest tubes, and whose rear end terminates near the rear end of the fire-box a short distance below its top. The sides of this arch are commonly supported by lugs or brackets fastened to the side sheets or by water-tubes placed at intervals underneath the arch and connecting the crown sheet and the tube sheet. *Ash-pans* are suspended beneath the fire-box for the purpose of catching and carrying the ashes and coals that may drop between the grate-bars; they are made of sheet steel.

The *smoke-box* is the chamber in the front of the boiler into which the gases of combustion flow from the tubes. There are two types of smoke-boxes in use, but the extension front shown by Figs. 7 and 8 is the type now almost invariably applied to new locomotives. In this box the gases issuing from the tubes either strike against the diaphragm plate and are deflected downward or pass through the netting and out of the stack which is located directly above the exhaust nozzle. The *exhaust nozzle* is the nozzle-like casting which terminates the exhaust-steam pipes from the cylinders. The successive cylinderfuls of steam pass up through it and out of the stack above in a succession of forcible blasts which entrain the gases in the smoke-box and carry them out of the stack, thus producing a partial vacuum in the smoke-box and consequently a suction or draught on the fire. The *smokestack* of a modern locomotive is usually open from top to bottom. In the older forms of locomotives the 'diamond stack' was always used, and it is still employed under special conditions.

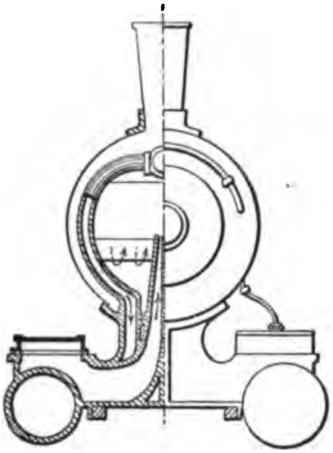


FIG. 8. SECTIONAL ELEVATION OF FRONT END OF A LOCOMOTIVE.

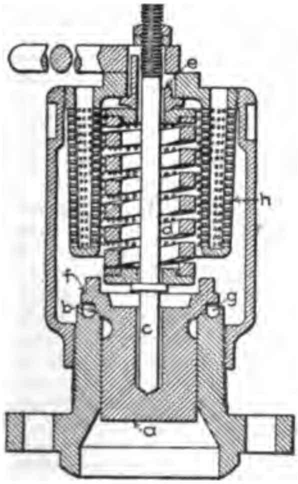


FIG. 9. LOCOMOTIVE SAFETY VALVE.

Among the necessary fittings of a locomotive boiler besides those already described are safety valve, whistle, steam-gauge, water-gauge, blower, throttle valve, dry pipe, and injectors. The locations of several of these fittings on the boiler are shown by Fig. 7.

Safety valves for locomotives are of the pop type, and two are always employed, giving an aggregate area of opening of about 1 square inch to each 2 square feet of grate surface. Fig. 9 is a section through a safety valve. The valve *a* rests upon the seat *b* and is held in place by the pressure of the spiral spring *d* bearing down on the spindle *e*. The pressure of this spring is regulated by screwing the collar *e* up and down. Outside of the valve-seat there is a projection *f* beneath which a groove *g* is cut in the casing. When the valve lifts this groove is filled with steam which presses against the portion of the valve outside of the seat, and by thus increasing the effective area of the valve, causes it to rise higher and remain open longer than it would without this device. The adjustment of the valve is so made that it will allow steam to escape until the pressure in the boiler is 4 pounds below the normal. The perforated casing or muffler *h* breaks the escaping steam into numerous single jets and thus reduces the noise of the escaping steam.

The *whistle* consists of a bell (A, Fig. 10) closed at the top and sharpened at the lower edge. By opening the valve shown the steam escapes through the narrow circular orifice B, and, entering the bell, sets up vibrations which cause the 'whistle.' The tone is controlled by the size of the bell and the pressure of the steam, being lower the larger the bell is, and louder the greater the steam pressure is. Chime whistles are commonly used, and they consist usually of a bell having three compartments, tuned respectively to the first, third, and fifth of the musical scale.

The *blower* consists of a pipe leading from the cab to the stack into which it turns upward so that by opening a valve a jet of steam is sent up through the stack and gives a draught on the fire when the locomotive is standing still and when, consequently, the exhaust is not acting as previously described.

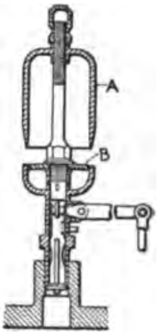


FIG. 10. LOCOMOTIVE WHISTLE.

The *throttle valve* in general use is a double-seated poppet valve, shown in section by Fig. 11. As will be seen, there are two valves, *a* and *b*, attached to a single stem. The upper valve, *a*, is the larger, and the lower valve, *b*, is of such diameter that it will pass through the upper valve-seat. The steam, therefore, exerts a pressure on the lower face of *b* and on the upper face of *a*, so that the valve is partly balanced, but the valve *a* being larger than the valve *b*, the downward pressure is the greater and tends to keep the valve closed. Considerable force is required to raise the valve against this pressure, and in order that this may be exerted so as to task the strength as little as practicable, the lever arrangement shown is employed. The rod *e* from the cab is attached to the bell-crank *d*, and this in turn is attached to the valve-stem E. The point of the bell-crank is provided with a slotted hole. At the start of the pull the length of the lever arm is about 2⅓ inches, while the long arm is 9½ inches. After the valve has been lifted from its seat and is free from the excess of pressure on *a*, the projecting horn A on the back of the bell-crank comes in contact with the bracket B, and the crank takes the position shown by the dotted line in the drawing. The end of the horn then becomes the pivot, and the length of the short arm of the lever is changed to 9½ inches and of the long arm to about 11½ inches. The *dry pipe* is the steam-pipe leading from the throttle valves to the engine cylinders, as shown by Fig. 7. *Injectors* are used for delivering feed-water to the boiler. See INJECTOR.

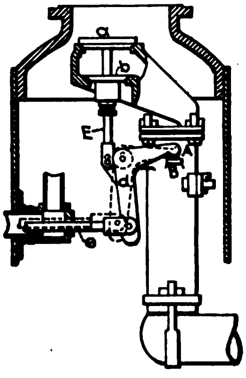


FIG. 11. LOCOMOTIVE THROTTLE VALVE.

The *engine* or the mechanism for applying the pressure of the steam generated in the boiler to the rotation of the driving wheels, consists of the cylinders, pistons and piston-rods, connecting-rods and parallel rods, with their attachments and appurtenances. The *cylinders* are placed one on each side of the locomotive near the front end, as shown in Fig. 8. There are three parts to each cylinder, viz. the cylinder, the steam-chest, and saddle. The saddles of the two cylinders, being bolted together, afford a support for the boiler, and in turn rest on the frame, as shown in Fig. 8. The steam-chest on each cylinder receives the steam from the boiler and contains the valve which admits it to the cylinder. Fig. 12 is a longitudinal section showing the inside of the cylinder and steam-chest of a simple locomotive. As will be seen, there is a steam-port from the chest to each end of the cylinder and between them an exhaust port, *b;* the motion of the valve alternately opens and closes the steam-ports so as to admit steam first at one end and then at the other end of the cylinder. In the drawing, Fig. 12, steam is shown entering the forward end of the cylinder and exhausting from the rear end. The *valve* most commonly used is a slide valve of D shape, but piston valves are also employed. A piston valve is shown in the succeeding section on compound locomotives. The sliding motion of the valve is controlled by a device commonly called the valve-gear.

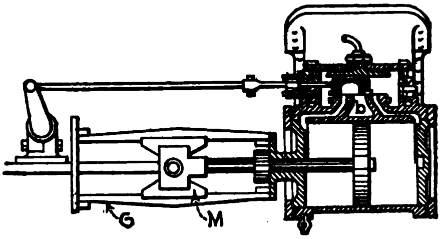


FIG. 12. SECTION OF CYLINDER.

Various forms of *valve-gear* are employed, but the one in most extensive use is the Stephenson link, the operation of which is explained in the article on STEAM-ENGINES. The valve motion is controlled from the cab by means of a lever known as the *reversing lever*. Inside the cylinder works the *piston*. This is a disk-shaped structure of metal, and is made in various ways, but always so as to fit the cylinder steam-tight, and so as to have ample strength to convey the push and pull of the steam to the piston-rod. The *piston-rod* is circular in section and is made of forged steel. It passes through the back cylinder-head by means of a circular orifice packed so as to be steam-tight and yet allow for movement to the rod. At its rear end the piston-rod connects with the *cross-head*, M, working between the guides G (Fig. 12). In Fig. 13 are shown another form of cross-head and guides and also the arrangement of the connecting-rod and the side rods for an engine with six drivers. Connecting-rods and side rods are made of forged steel and have I sections.

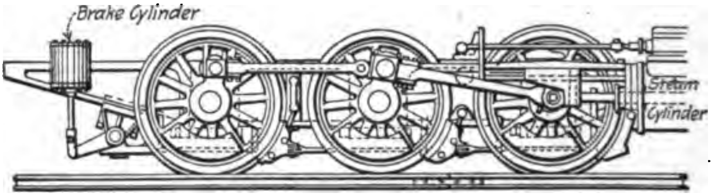


FIG. 13. DRIVING WHEELS, CONNECTING RODS, AND BRAKE GEAR OF LOCOMOTIVE.

The *frame* of a locomotive is the platform by which the boiler and engine are supported on the wheels. In America bar frames are nearly always employed. Fig. 14 shows the frame for a heavy freight locomotive. It will be seen that the top and bottom rods of the frame are connected by vertical struts known as pedestal-jaws, between which come the boxes of the driving wheels. On the bottoms of the pedestal-jaws are bars or binders known as pedestal-caps. The number of jaws and style of frame are governed mostly by the number of driving wheels. In order to make an engine ride easily and to reduce the shock and concussion on the running gear, the engine is provided with springs placed over each driving box and carried on a saddle which straddles the frame and rests on the driving box, as shown by Fig. 14. In order to equalize the weight between drivers there are provided bars between the drivers which are called equalizing bars.

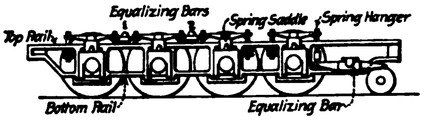


FIG. 14. FRAME FOR CONSOLIDATION LOCOMOTIVE.

Driving wheels are made with cast iron or cast steel centres with a forged steel tire. The usual method of attaching the tire to the centre is to bore the tire slightly smaller than the centre and then expand it by heat until it slips over the centre onto which it shrinks. Driving wheels always have counterbalance weights attached on the side opposite the crank-pin to neutralize the shock which an unbalanced wheel gives to the track. As an indication of the quantities and quality of the different materials which enter into the construction of a modern heavy locomotive, as described above, the following figures given by W. H. Marshall, superintendent of motive power, Lake Shore and Michigan Southern Railway, are of interest. The engine selected as an example is a passenger engine, weighing about 175,000 pounds, and having three pairs of 80-inch drivers. Some of the small details have not been estimated, and others have been omitted from these figures because of their miscellaneous character; such, for instance, as the brasswork about the engine, cab-fittings, the piping, boiler-lagging, boiler-jackets, etc. Exclusive of these the amount of wrought iron in the engine is 16,950 pounds; cast iron, 19,550 pounds, of which 11,350 pounds are in the cylinders and 1760 pounds in the grates; cast steel, 27,660 pounds, of which about 16,000 pounds are in the driving and truck wheels; pressed steel, 1650 pounds; rolled-steel plates and shapes, 3770 pounds; forged steel, 11,270 pounds; tire-steel, 10,500 pounds; malleable iron, 1300 pounds; and wood, 4100 pounds. The boiler weighs 47,850 pounds, and the water in the boiler 22,500 pounds, making a total weight of 167,100 pounds.

Classification. Locomotives are classified according to the number and arrangement of their driving and truck wheels. The various classes and the service for which each is chiefly employed are as follows: *American* or *eight-wheeled locomotive:* this type of locomotive has two pairs of driving wheels with a four-wheeled truck in front of them and is employed chiefly in passenger service. *Atlantic locomotive:* this type of locomotive consists of two pairs of drivers, a four-wheeled leading truck and a pair of trailing wheels, and is employed exclusively for high-speed passenger service. *Mogul locomotive:* this type of locomotive has three pairs of drivers and a pair of leading wheels, and is used for heavy freight service and to a considerable extent for passenger service. *Ten-wheeled locomotive:* this type of locomotive has three pairs of drivers and a four-wheeled leading truck, and is employed for heavy and high-speed passenger service. *Consolidation:* this type of locomotive has four pairs of drivers and a pair of leading wheels, and is used exclusively for freight service. *Decapod:* this type of engine has five pairs of drivers and no truck-wheels, and is used as a pushing engine on heavy grades and for very heavy freight service. *Mastodon:* this type of engine has four pairs of drivers and a four-wheeled leading truck. *Switching:* for switching purposes engines having either two pairs or three pairs of drivers are used and are known respectively as 'four-wheeled' and 'six-wheeled' switchers. *Forney:* this type of engine has two pairs of drivers placed well forward and a four-wheeled trailing truck, and is used for suburban passenger and elevated railway service. There are several other types of locomotives in limited use, but those named are the standard forms.

Compound Locomotives. The compound locomotive is one in which the steam is admitted to one cylinder called the high-pressure cylinder, where it partially expands in doing its work, and whence it exhausts into the steam-chest of a larger cylinder, called the low-pressure cylinder, where it completes its expansion and finishes its work. The compound principle has been applied to locomotives in three ways: (1) Two-cylinder compounds, with a cylinder on each side; the steam passes from the high-pressure cylinder on one side through the smoke-box and across the engine to the low-pressure cylinder on the opposite side; (2) three-cylinder compounds, with a high-pressure cylinder on each side, the steam from which exhausts into a low-pressure cylinder beneath the smoke-box; (3) four-cylinder compounds, with a high-pressure and a low-pressure cylinder on each side of the engine, each pair working independently of the other. In the United States four makes of two-cylinder locomotives are in use; they are named the Richmond, Schenectady, Pittsburg, and Brooks, from the names of the works at which they originated. These four makes differ from each other principally in the construction and operation of their intercepting valves. This valve is an ingenious and rather complicated mechanism, whose function it is to admit live steam from the boiler directly into the low-pressure cylinder, and then to cut off that flow of steam when the exhaust of the high-pressure cylinder has raised the pressure in the receiver leading to the low-pressure cylinder sufficiently to enable it to deliver steam to the latter. The necessity of being able to deliver live steam into the low-pressure cylinder arises when the crank of the high pressure stops on the dead centre. Intercepting valves are sometimes designed to cut off the live steam automatically, and sometimes this operation is performed from the cab by suitable lever arrangements.

Three-cylinder locomotives have only been used experimentally in the United States, but they have met with considerable favor in Europe. Four-cylinder compound locomotives are of two forms; in one, the high-pressure cylinder is set above the low-pressure cylinder, as shown in Fig. 15, and in the other the two cylinders on each side are set end to end, or tandem. The form of four-cylinder compound most used in the United States is that having each pair of cylinders arranged as shown in Fig. 15. This drawing shows the piston-valve between the two cylinders, and by means of the arrows the course of the steam from its entrance to the high-pressure cylinder to its exhaust from the low-pressure cylinder. The general use of compound locomotives is of comparatively recent date, the first locomotive of this type having been built in 1875. The great advantage claimed for the compound locomotive is economy of fuel, which is variously stated to be from 10 per cent. to 30 per cent. over single engines.

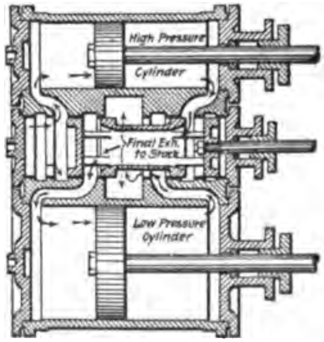


Fig. 15. cross-section of cylinders.

Recent Developments. Between 1890 and 1900 the American locomotive experienced a wonderful development. In 1890 in America an eight-wheeled locomotive, with 18 × 24-inch cylinders and a boiler having about 2200 square feet of heating surface, was in quite general use for first-class passenger service; the weight on the drivers seldom exceeded 65,000 pounds, and the total weight of the engine was usually within 100,000 pounds in working order. In freight service engines weighing between 100,000 and 120,000 pounds on the drivers were considered powerful locomotives. To-day passenger locomotives, if provided with two pairs of drivers, often have from 85,000 to 105,000 pounds upon them, and if of the ten-wheel type they have from 100,000 to 135,000 pounds upon drivers; the cylinders are 19 or 20 inches in diameter; the heating surface is from 2200 to 3000 square feet, and the grate area is from 30 to 36 square feet, unless wide grates are provided for burning some special grade of coal.

Perhaps the most important developments in passenger locomotives have been in the direction of high speed; and in this the American locomotives now maintain the best records, although they have been eclipsed on several occasions by those of European railways, which usually do not maintain their record speeds or keep to their advertised schedules. The type of engine shown on the accompanying plate has attained a speed of 7.05 miles at the rate of 105.75 miles per hour, and 7.29 miles at the rate of 103.35 miles per hour while drawing the Empire State Express on the New York Central and Hudson River Railroad. These speeds were made on a total run of 80 miles, during which the average speed was 67.60 miles per hour with a train consisting of six cars weighing 261 tons. A similar engine with a train which with the engine and tender aggregated 731.19 tons developed an average speed of 55.8 miles per hour for two hours and seven minutes. The horse-power developed by this engine was estimated at over 1900, and is, as far as known, the highest horse-power ever developed in passenger service.

The dimensions and other data for this engine are as follows:

High-Speed Passenger Locomotive, Schenectady Works.
American Locomotive Company.

Central Atlantic type: Gauge, 4 feet 8½ inches.
Cylinders, 21 inches diameter, 26-inch stroke.
Drivers, 79 inches diameter.
Wheel-base, driving 7 feet, total 27 feet 3 inches.
Weight, on drivers, 95,000 pounds, total 176,000 pounds.
Tank capacity, 5,000 United States gallons.
Weight of tender with coal and water, 110,500 pounds.
Traction power, 24,700 pounds.
Boiler pressure, 200 pounds.
Heating surface, tubes, 3298.08 square feet.
Heating surface, water-tubes, 27.09 square feet.
Heating surface, fire-box, 180 square feet.
Heating surface, total, 3505.17 square feet.
Grate area, 50.3 square feet.

A freight locomotive with 150,000 pounds on the drivers is not considered a large locomotive for ordinary road work, and for mountain service and for pushing on heavy grades, engines have been built with as much as 232,000 pounds, as is the case with the decapod engine shown on the accompanying plate, which can move on a level at slow speed over 10,000 tons of load, exclusive of weight of engine and tender. The following table contains its dimensions and other specifications:

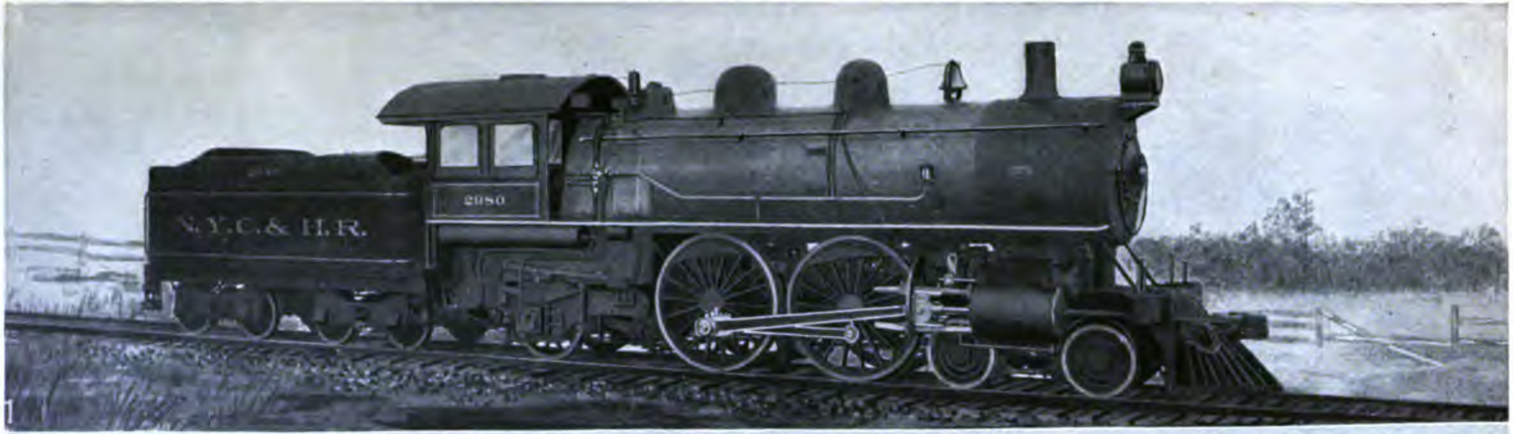
Tandem Compound Engine, Schenectady Works.
American Locomotive Company.

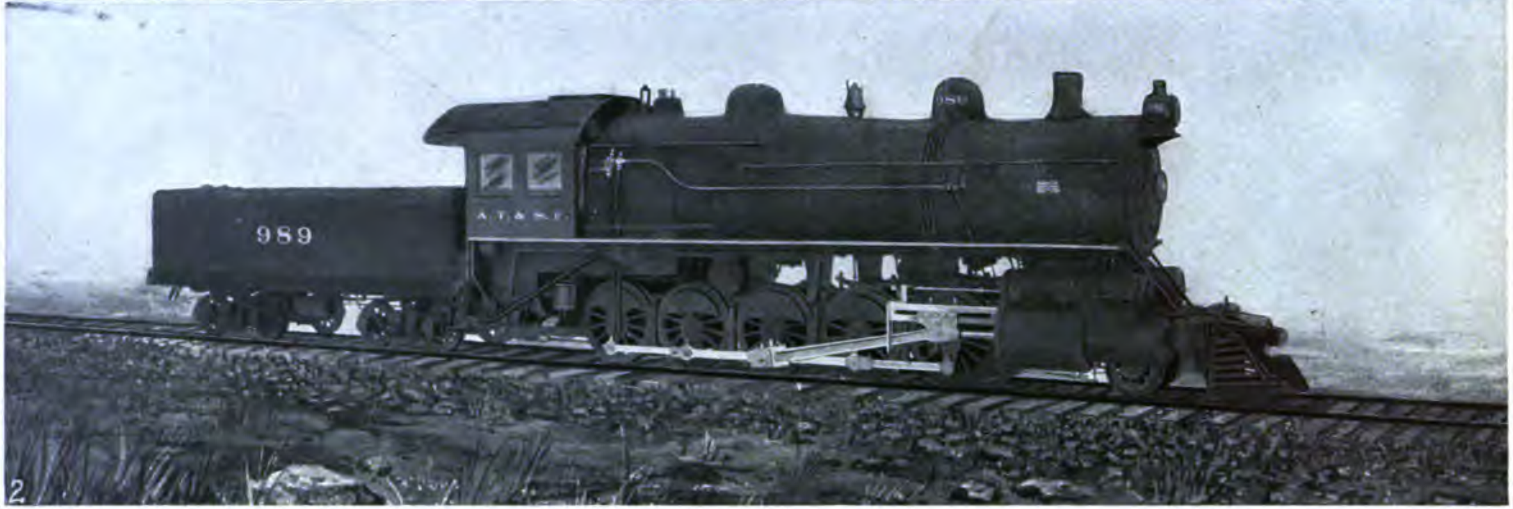
Decapod type: Gauge, 4 feet 8½ inches.
Cylinders, 17½ and 30 inches diameter, 34-inch stroke.
Drivers, 57 inches diameter.
Wheel-base, driving 20 feet, total 28 feet 11 inches.
Weight, on drivers, 232,000 pounds, total 259,800 pounds.
Tank capacity, 7000 United States gallons.
Weight of tender with coal and water, 134,900 pounds.
Traction power 55,300 pounds.
Boiler pressure 225 pounds.
Heating surface, tubes, 4476.5 square feet.
Heating surface, fire-box, 205.4 square feet.
Heating surface, total, 4681.9 square feet.
Grate area, 59.47 square feet.

In general, the tendency everywhere is toward larger locomotives. The accompanying tables give the main dimensions of a number of the heaviest freight and passenger locomotives which have been built in the United States during recent years. European locomotives differ from those used in America chiefly in the following particulars: The American locomotive has a bar frame and carries its cylinders outside of the frame, while English and many European locomotives have a plate frame and usually carry the cylinders inside of the frame. The frame of the American engine usually rests on the wheels through the medium of equalizing springs, while equalizing springs are but seldom used on European engines. Eight-wheel tenders are universal in America, while four-wheel and six-wheel tenders are used in Europe. The roomy cabs with seats for the driver and fireman were for many years peculiar to American engines, but are gradually being adopted on the Continent of Europe.

Logging Locomotives. The locomotives ordinarily known as logging locomotives are of two types. One is built after the general pattern of the four-wheeled switching locomotive, with the exception that the wheels have broad grooved tires a foot or so in width that are adapted to running upon a track formed of logs placed end to end. The other is known as the Shay locomotive and is fitted to run on ordinary rails. Such an engine is shown in Fig. 16. It is built on three four-wheeled centre-bearing swiveled trucks, the wheels of which are driven by bevel gearing attached to the right-hand wheels of each truck with steel pinions meshing into them, carried by a shaft running in bearings attached to the journal-boxes, and extending from axle to axle of each truck. The power is communicated in these pinion shafts with flexible couplings extending from the engines, which are placed vertically on the side of the boiler. This arrangement leaves each truck free to adjust itself to curves and irregularities of the track. The three trucks here spoken of include the tender truck, which is a driving truck also. The trucks are built of steel, are equalized, and have coiled springs. The object of this construction is to have the shortest possible rigid wheel-base and the longest possible flexible wheel-base, thus utilizing all the weight for traction. It is possible to work the locomotive on very sharp curves, the one illustrated running easily on a 65-degree curve. Its use is confined to roads having heavy grades and sharp curves, and it is restricted to low speeds. The frames of both engine and tender are made of 10-inch I-beams, one on each side, that of the engine being strengthened by a truss-rod as shown. Steam brakes are provided to act on part or all of the drivers, either separately or together.

LOCOMOTIVES





1. CENTRAL ATLANTIC TYPE PASSENGER LOCOMOTIVE. This type of engine hauled the Empire State Express between Syracuse and Rochester in 1903.
2. DECAPOD TYPE HEAVY FREIGHT LOCOMOTIVE. Designed for Mountain Service.

Built by American Locomotive Company.

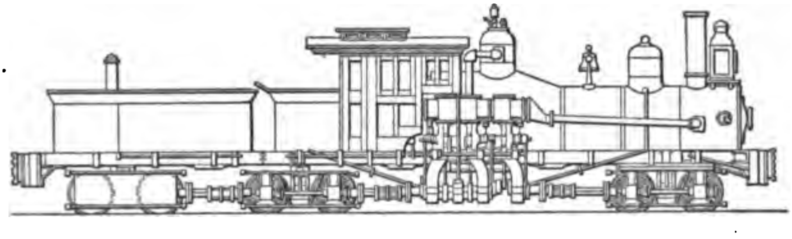


FIG. 16. GEARED LOCOMOTIVE FOR LOGGING RAILWAY.

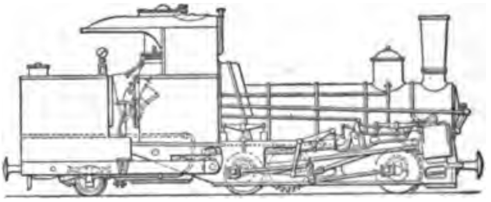


FIG. 17. LOCOMOTIVE FOR RACK RAILWAY.

Rack Locomotives are used on roads where the grades are too steep to be operated by the ordinary traction locomotive. The adhesion between the wheel and the rail of such an engine cannot be taken at more than 25 per cent. of the weight on the drivers. Hence when the grade becomes so steep that the resultant of gravity acting parallel to the wheels becomes equal to 25 per cent. of the weight on the driving wheels it will be impossible for the locomotive to advance. Such a grade is reached when the rise is 1320 feet to the mile. Practically it is much less than this. So on a grade of one-half of this the engine could at best only hold, not haul, itself and a load equal to its own weight. Hence for roads climbing mountains where the gradient is necessarily very steep the rack locomotive is used. Such an engine is shown in side elevation in Fig. 17. The weight of the locomotive is carried on smooth rails in the ordinary manner, and while the grade lies within the limits of its weight to overcome, it is propelled by driving wheels like other engines. But when the grade becomes too steep, the gear-wheel is brought into mesh with a rack rail laid in the centre of the track between the other two. The teeth of this gear engage with those of the rack and propel the engine independently of the power which is developed at the driving wheels and which would be insufficient to do the work. Between the two main driving axles is another driving axle, carrying a gear-wheel, which meshes with the rack. This gear-axle is driven through reducing gearing by a pair of inside cylinders. In addition to the two main axles there is another rear

PRINCIPAL DIMENSIONS OF RECENT HEAVY FREIGHT LOCOMOTIVES

Railway	Illinois Central	Illinois Central	Union	Great Northern
Type	12-wheel	Consolidation	Consolidation	12-wheel
Builder	Brooks	Rogers	Pittsburg	Brooks
Driving wheels	4 ft. 9 ins.	4 ft. 9 ins.	4 ft. 6 ins.	4 ft. 7 ins.
Wheel-base, driving	15 ft. 9 ins.	16 ft. 3 ins.	15 ft. 7 ins.	15 ft. 10 ins.
Total	26 ft. 6 ins.	24 ft. 5 ins.	24 ft. 0 ins.	26 ft. 8 ins.
Weight on drivers	193,200 lbs.	194,000 lbs.	208,000 lbs.	172,000 lbs.
Total	232,200 lbs.	214,000 lbs.	230,000 lbs.	212,750 lbs.
Engine and tender	364,900 lbs.	....	334,000 lbs.	308,750 lbs.
Compound or simple	Simple	Simple	Simple	Simple
Cylinders	23 X 30 ins.	23 X 30 ins.	23 X 32 ins.	21 X 34 ins.
Boiler, diameter	6 ft. 8 ins.	6 ft. 6 ins.	6 ft. 8 ins.	6 ft. 6 ins.
Pressure	210 lbs.	210 lbs.	200 lbs.	210 lbs.
Fire-box	11 ft. X 3 ft. 6 ins.	11 ft. X 3 ft. 6 ins.	10 ft. X 3 ft. 4 ins.	10 ft. 4 ins. X 3 ft. 4½ ins.
Tubes, number	424	417	355	376
Diameter	2 ins.	2 ins.	2¼ ins.	2¼ ins.
Length	14 ft. 8⅝ ins.	13 ft.	15 ft.	13 ft. 10⅝ ins.
Heating surface, tubes	3,237 sq. ft.	2,951 sq. ft.	3,117 sq. ft.	3,043 sq. ft.
Total	3,500 sq. ft.	3,203 sq. ft.	3,322 sq. ft.	3,280 sq. ft.
Grate area	37½ sq. ft.	38½ sq. ft.	33½ sq. ft.	34 sq. ft.
Water in tank	7,000 gallons	5,000 gallons	....	4,670 gallons
Coal on tender	28,800 lbs.	....	....	22,400 lbs.

Railway	Southern Pacific	Northern Pacific	C., C., C. and St. L.	Buf., R. & Pitts.	P., B. & L. E.
Type	12-wheel	12-wheel	Consolidation	12-wheel	Consolidation
Builder	Schenectady	Schenectady	Richmond	Brooks	Pittsburg
Driving wheels	4 ft. 7 ins.	4 ft. 7 ins.	4 ft. 8 ins.	4 ft. 7 ins.	4 ft. 6 ins.
Wheel-base, driving	15 ft. 6 ins.	15 ft. 6 ins.	16 ft. 3 ins.	15 ft. 6 ins.	15 ft. 7 ins.
Total	26 ft. 5 ins.	26 ft. 4 ins.	24 ft. 2 ins.	25 ft. 5 ins.	24 ft. 4 ins.
Weight on drivers	155,000 lbs.	150,000 lbs.	162,000 lbs.	148,000 lbs.	225,000 lbs.
Total	192,000 lbs.	186,000 lbs.	180,000 lbs.	175,000 lbs.	250,300 lbs.
Engine and tender	291,535 lbs.	270,620 lbs.	300,000 lbs.	265,000 lbs.	391,400 lbs.
Compound or simple	2-cyl'der, comp'd.	2-cyl'der comp'd.	Simple	Simple	
Cylinders	23 and 35 X 32 ins.	23 and 34 X 30 ins.	22 X 30 ins.	21 X 26 ins.	24 X 32 ins.
Boiler, diameter	6 ft.	6 ft.	6 ft.	5 ft. 6¾ ins.	7 ft. 4 ins.
Pressure	200 lbs.	200 lbs.	200 lbs.	180 lbs.	220 lbs.
Fire-box	10 ft. X 3 ft. 6 ins.	10 ft. X 3 ft. 6 ins.	9 ft. 11 in. X 3 ft. 5 in.	9½ ft. X 3 ft. 2¼ ins.	11 ft. X 2 ft. 6¼ in.
Tubes, number	332	332	376	324	406
Diameter	2¼ ins.	2¼ ins.	2 ins.	2 ins.	2¼ ins.
Length	14 ft. 6 ins.	14 ft.	13 ft. 5 ins.	12 ft. 7$\frac{4}{16}$ ins.	15 ft.
Heating surface, tubes	2,819.34 sq. ft.	2,721.60 sq. ft.	2,623.00 sq. ft.	2,106.0 sq. ft.	3,564 sq. ft.
Total	3,025.85 sq. ft.	2,943.41 sq. ft.	2,800.00 sq. ft.	2,331.0 sq. ft.	3,805 sq. ft.
Grate area	35.00 sq. ft.	35.00 sq. ft.	33.88 sq. ft.	30.4 sq. ft.	36.8 sq. ft.
Water in tank	4,500 gallons.	4,000 gallons	6,000 gallons	4,500 gallons.	7,500 gallons
Coal on tender	22,400 lbs.	15,000 lbs.	22,400 lbs.	18,000 lbs.	28,000 lbs.

Dimensions of Recent Ten-Wheel Passenger Locomotives

Railway	L. S. and M. S.	Grand Trunk	N. Y. Central	Den. and R. Grande
Builder	Brooks	Schenectady	Schenectady	Brooks
Driving wheels	6 ft. 8 ins.	6 ft. 0 ins.	5 ft. 10 ins.	5 ft. 3 ins.
Wheel-base, driving	16 ft. 6 ins.	15 ft. 8 ins.	14 ft. 8 ins.	13 ft. 0 ins.
Wheel-base, total	27 ft. 4 ins.	26 ft. 11 ins.	26 ft. 0 ins.	23 ft. 7 ins.
Weight on drivers	133,000 lbs.	125,000 lbs.	126,000 lbs.	124,000 lbs.
Weight total engine	171,600 lbs.	166,000 lbs.	164.000 lbs.	160,000 lbs.
Weight, engine & tender.	283,600 lbs.	268,000 lbs.	....	272,000 lbs.
Compound or simple	Simple	Simple	Simple	Simple
Cylinders	20 X 28 ins.	20 X 26 ins.	20 X 28 ins.	21 X 26 ins.
Boiler, diameter	5 ft. 6 ins.	5 ft. 0 ins.	5 ft. 6 ins.	5 ft. 8 ins.
Boiler pressure	210 lbs.	200 lbs.	200 lbs.	210 lbs.
Fire-box	10 ft. 1 in. X 3ft. 5 ins.	10 ft. 7 ins. X 3 ft. 4 ins.	9 ft. X 3 ft. 4 ins.	10 ft. 1 in. X 3 ft. 5 ins.
Tubes, number	345.	291	360	426
Tubes, diameter	2 ins.	2 ins.	2 ins.	2 ins.
Tubes, length	15 ft. 0¼ in.	15 ft.	14 ft. 4 ins.	13 ft. 4 ins.
Heating surface, tubes	2,694 sq. ft.	2,270 sq. ft.	2,686 sq. ft.	2,257 sq. ft.
Heating surface, total	2,917 sq. ft.	2,470 sq. ft.	2,886 sq. ft.	2,422 sq. ft.
Grate area	33.6 sq. ft.	33.4 sq. ft.	30.2 sq. ft.	33.6 sq. ft.
Water in tank	5,000 gallons	4,500 gallons	4,500 gallons	5,500 gallons
Coal on tender	19,000 lbs.	20,000 lbs.	20,000 lbs.	16,000 lbs.

Railway	Southern	Atch., T. and S. F.	Fitchburg	Baltimore and Ohio
Builder	Richmond	Dickson	Baldwin	Baldwin
Driving wheels	6 ft. 0 ins.	6 ft. 1 in.	6 ft. 6 ins.	6 ft. 6 ins.
Wheel-base, driving	14 ft. 7 ins.	15 ft. 0 ins.	14 ft. 6 ins.	13 ft. 8 ins.
Wheel-base, total	26 ft. 1 in.	25 ft. 2 ins.	26 ft. 3 ins.	24 ft. 6 ins.
Weight on driver	121.250 lbs.	125,300 lbs.	111,000 lbs.	113,000 lbs.
Weight total engine	158,000 lbs.	156,800 lbs.	150,000 lbs.	147,000 lbs.
Weight, engine & tender.	245,500 lbs.	249,200 lbs.	244,000 lbs.	229,000 lbs.
Compound or simple	Simple	Simple	4-cylinder compound	Simple
Cylinders	21 X 28 ins.	19½ X 28 ins.	15 and 25 X 26 ins.	21 X 26 ins.
Boiler, diameter	5 ft. 1 in.	4 ft. 11 ins.	5 ft. 0 ins.	5 ft. 0 ins.
Boiler pressure	200 lbs.	180 lbs.	200 lbs.	190 lbs.
Fire-box	10 ft. X 3 ft. 6 ins.	7 ft. 4 ins .X 8 ft. 9 ins.	10 ft. X 3 ft. 5 ins.	10 ft. X 3 ft. 5 ins.
Tubes, number	295	264	328	231
Tubes, diameter	2¾ ins.	2⅞ ins.	2 ins.	2¼ ins.
Tubes, length	14 ft. 5 ins.	14 ft. 10 ins.	15 ft. 1 in.	14 ft. 7½ ins.
Heating surface, tubes	2,217 sq. ft.	1,796 sq. ft.	2,576 sq. ft.	1,970 sq. ft.
Heating surface, total	2,410 sq. ft.	1,960 sq. ft.	2,748 sq. ft.	2,194 sq. ft.
Grate area	35 sq. ft.	25 sq. ft.	34.5 sq. ft.	34.3 sq. ft.
Water in tank	4,500 gallons	4,650 gallons	4,500 gallons	4,000 gallons
Coal on tender	14,000 lbs.	16,000 lbs.	....	7,244 lbs.

axle carrying, besides its pair of wheels, a brake-pinion. The crank-pins are made spherical so as to afford the necessary flexibility when rounding sharp curves. All four cylinders have the same diameter and length of stroke and are independent of one another so far as steam-supply is concerned. When running along the ordinary track the inner cylinders have no steam-supply and do not perform any work.

In the matter of brakes there are the ordinary brake-shoes on the driving wheels and strap brakes on the rear locomotive truck axles, and air-brakes on the cars. Such an engine as that shown in Fig. 17 is calculated to haul 40 tons up a 90 per cent. grade at a speed of five miles an hour. This class of engine is extensively used on the mountain railroads of Switzerland. It is also used on the roads running up Mount Washington and Pike's Peak in the United States.

Bibliography. The early history of locomotive construction and performance is given very fully in Colburn, *Locomotive Engineering* (London, 1871). Interesting chapters on locomotives are found in Thurston, *Growth of the Steam Engine* (New York, 1878; 4th ed. 1897). Meyer, *Modern Locomotive Construction* (New York, 1892), and Whitridge, *Modern Locomotives* (New York, 1897), give a large amount of information regarding modern practice in locomotive construction. A small book of unusual value is Reagan's *Locomotive Mechanism and Engineering* (New York, 1903).

LOCOMOTIVE ENGINEERS, Brotherhood of. See Railway Brotherhoods.

LOCOMOTIVE FIREMEN, Brotherhood of. See Railway Brotherhoods.

LOCOMOTIVES, Electric. See Electric Railways.

LOCOMOTOR ATAXIA (Neo-Lat., from Lat. *locus*, place + *motor*, mover, and Gk. *ἀταξία*, disorder, from ἀ-, *a-*, not + *ταξία*, *taxia*, order, from *τάσσειν*, *tassein*, to arrange), or Tabes Dorsalis. A disease of the nervous system, commonly of the posterior root-zones of the spinal cord, characterized by incoördination of movements and by sensory and trophic disturbances. It is not paralysis, but loss of power to order harmoniously the muscles that move the body and maintain equilibrium. It begins insidiously and grows slowly. The earlier symptoms are usually disorder of vision, a girdle sensation, with shooting pains through the limbs; increasing or perverted sensibility, and disturbance in the functions of the bladder and of the rectum resembling neuralgia or sciatica. Later, the patient feels that his walking is not firm and sure; that there is some soft substance between his feet and the ground; he walks with difficulty, and with short, hurried steps; each leg is lifted well up, but as he moves it forward, it is thrown out from him and the heel descends with force while the sole comes awkwardly after it. He now requires the aid of vision to walk at all, and looks steadily at his feet or at a point a little in front of them, and he cannot make a sudden turn without great risk of falling. If he stands erect with his feet together or nearly so, and closes his eyes, he begins to totter, and would fall if not supported. These phenomena are not primarily the result of weakness of motor power, but of defective muscular coördination. Diminished sensibility in the feet and legs is usual in this disease. The upper limbs are sometimes affected, so that, though the hands retain all their natural muscular power, the sufferer cannot unfasten a button, or pick up a pin, or feed himself. As the disease progresses, this muscular incoördination (ataxia) increases until the person affected is unable to walk at all. Paralysis of various muscles may occur, notably of some of those of the eye. The involvement of the bladder produces a loss of the power of urination, and general weakness results in death. Although usually going to a fatal termination, the disease is sometimes arrested, and appears to be quite conquered particularly in its earlier stages. In most cases it extends over several years. Locomotor ataxia arises from disease of a portion of the posterior spinal ganglia, later involving the posterior columns and the posterior nerve-roots, which become atrophied and degenerated. The exciting causes are not well understood, but exposure to cold, overexertion, privation, intemperance, and mental anxiety have been suggested as probable. It is probable that syphilis is the most important single cause, at least 60 to 70 per cent. being due to this alone, or to syphilis combined with alcoholism. Anti-syphilitic treatment results in amelioration in some cases. It is sometimes hereditary, and is more common among males than females. It is developed usually not till middle life, from the age of thirty to fifty. Beyond alleviation of pain, little can be done by medicine, though many remedies have been tried. Electricity has been recommended by eminent authorities. Perhaps the best course is to attend carefully to the general health and regimen. Much can be done for the ataxia by systematic exercises carried out under a physician's instructions. Consult Potts, *Nervous and Mental Disease* (Philadelphia and New York, 1900).

LOCO-WEED. See Astragalus; Loco Disease.

LO'CRI, or Locri Epizephyrii. See Locris.

LO'CRIS (Lat., from Gk. Λόκρις, *Lokris*). A district of ancient Greece. Legend told of a King Locros, a descendant of Deucalion, who ruled over the Leleges on the coast of the mainland opposite Eubœa, and whose wife, a daughter of the King of Elis, bore to Zeus a son Opus. Later, moved by the strife of his sons, Locros is said to have crossed the mountains to the southwest and formed a new settlement on the shores of the Corinthian Gulf. The Locrian tribes seem to have been forced asunder by the invasions from the north, and in historic times two distinct tribes were known. The eastern Locrians, divided into the Opuntian and Epicnemidian, dwelt opposite the island of Eubœa on the northeast coast of Greece. The western Locrians, called Ozolian, lived on the Corinthian Gulf, west of Phocis. Neither division played any prominent part in Greek history. Early in the seventh century B.C. a colony, probably of the Opuntian Locrians, settled at Cape Zephyrium in Magna Græcia, and a few years later moved to a site about five miles south of the modern Gerace, where they founded Locri Epizephyrii. The city never attained the prosperity of the great trading colonies, but seems to have been a prosperous farming community. It was celebrated for its severe but just code of laws, attributed to Zaleucus, who is said to have lived about the middle of the seventh century B.C., and to have been the first Greek to prepare a written code. So highly was his work esteemed that it is said to have remained unaltered for centuries. The Locrians won great fame by defeating the much more powerful city of Crotona in a bloody battle at the River Sagras about B.C. 525, a victory which they ascribed to the personal intervention of the Dioscuri. The town was seized by the younger Dionysius, after his expulsion from Syracuse in B.C. 356, and ruled with the greatest tyranny until his return to Syracuse in B.C. 346, when the inhabitants rose and took a frightful vengeance on his family, who had been left behind. During the wars of Rome with Pyrrhus and Carthage, the city was alternately occupied by the opposing parties, and its temple of Persephone was finally plundered by the Romans, who, however, made restitution later. Soon after it seems to have declined in importance, but is mentioned by Procopius in the sixth century A.D., and was probably destroyed by the Saracens. In 1889 and 1890 excavations near Gerace brought to light the foundations of a temple, possibly that of Persephone. Consult *Römische Mittheilungen*, vol. v. (1890), and *Antike Denkmäler*, i. 5 (1890).

LOCUS (Lat., place). The place of all points satisfying a given condition. For example, the circumference of a circle whose centre is O and whose radius is r is the locus of all points satisfying the condition of being in the same plane and at a distance r from a fixed point O in that plane. In space, the locus is the surface of a sphere of centre O and radius r. In proving a theorem concerning the locus of points, it is necessary and sufficient to prove two things: that any point on the supposed locus satisfies the given condition, and that any point not on the supposed locus does not satisfy the condition. A few important propositions of loci are: (1) The locus of points equidistant from two given points is the perpendicular bisector of the line joining them; (2) the locus of points equidistant from two given lines consists of the bisectors of their included angles; (3) the locus of points equidistant from three given points is the perpendicular to their plane passing through the centre of the circle on which they lie; (4) the locus of points the sum of whose distances from two fixed points is constant is an ellipse whose foci are the given points; (5) the locus of the vertices of constant angles subtended by a given line-segment is an arc of which that segment is the cord; (6) if a pair of variable quantities, x, y, are connected by an equation, and each pair of values is represented by a point in a plane, these points will be on a definite curve called the locus or graph of the equation. (See Coördinates.) Thus the study of curves by analytic methods is a development of the theory of loci. (See Curves.) The method of loci in pure geometry was extensively used by the Greek geometers, particularly Apollonius, Hippias, Eudoxus, Nicomedes, and Diocles. The methods of Apollonius were restored by Robert Simson in his *De Locis Planis* (1748), but as an analytic instrument the theory of loci dates from Descartes (1637).

LOCUS DELICTI (Lat., place of crime or wrong). In criminal law, the place where a crime is actually committed. The question of *locus delicti* usually arises when a wrongful act is commenced in one jurisdiction and continued in another. For example, if goods are stolen in New Jersey and carried by the thief into Delaware, the larceny was committed in New Jersey, as the wrongful taking with intent to steal constitutes the crime. However, a State may make it a distinct statutory crime to knowingly bring stolen goods into the State; but in absence of such a statute such a criminal could not be punished, except in the State where he originally stole the goods. However, if a man stands in New Jersey and shoots another across the line in New York, he is guilty of murder in the latter State, as the killing was as much there as in New Jersey.

The phrase is also used in the law of torts, but is not of as great importance as in criminal law, as jurisdiction of such civil causes merely depends on jurisdiction of the parties. See CRIME; JURISDICTION.

LOCUS PŒNITENTIÆ (Lat., place of repentance). In the Scotch law, the time within which, if a person withdraw from a contemplated bargain or contract or repent of an intention to commit a crime, he incurs no liability. See CONTRACTS; CRIME.

LOCUST (from Lat. *locusta*, locust, lobster). Any orthopterous insect of the family Acridiidæ. Much confusion has arisen in the use of this term, for two reasons: The family Locustidæ, including the typical genus Locusta, are popularly termed 'long-horned grasshoppers'; and, on the other hand, 'locust' is given popularly (in the Orthoptera) only to members of the Acridiidæ, which are also termed 'short-horned grasshoppers.' (See GRASSHOPPER.) In the United States a further confusion arises from the fact that the term 'locust' is applied to any member of the hemipterous family Cicadidæ, which includes the so-called seventeen-year 'locust' or periodical cicada (see CICADA and HEMIPTERA) and the common dog-day harvest-fly. The name, however, should be restricted to the insects of the family Acridiidæ, and is so used by all English-speaking people except in portions of the United States.

Locusts may be distinguished from the long-horned grasshoppers and the crickets, such as the common *Anabrus simplex*, by the relatively short antennæ, the short ovipositor of the female, and the long hind legs with thickened thighs. They stridulate by the friction of the rough hind legs against the wing-covers, this method differing from the stridulation of the katydids and crickets (q.v.). The wing-covers are leathery and narrow, the wings themselves being broad, and when at rest folded like a fan.

The power of flight in locusts varies with the species. Those capable of sustaining prolonged flight have large trachæal dilatations within the body. The species of greatest economic importance in the United States are the Rocky Mountain locust (*Melanoplus spretus*), the red-legged locust (*Melanoplus femur-rubrum*), the lesser migratory locust (*Melanoplus Atlantis*), the American locust (*Schistocerca Americana*), and the differential locust (*Melanoplus differentialis*). The Old World migratory locusts belong principally to two species, *Pachytylus migratorius* and *Acridium peregrinum*. A South American species of the genus Acridium frequently inflicts great damage upon crops in Argentina and Chile, while in South Africa a migratory locust comes down from the north in swarms and destroys the crops of the settlers. These few species, possessing great powers of multiplication and extended powers of flight, have been classed among the world's historical scourges. Early incursions in Europe and North Africa are mentioned by Ororius and Saint Augustine, the latter recording a plague in Numidia which resulted in the death of 800,000 men. Pliny states that locusts came over in great swarms from Africa to Italy in his time. Incursions as far north as Germany occurred in 1333 lasting until 1336, 1475, 1527, 1543, 1636, 1686, and at intervals until 1856-59.

The Rocky Mountain locust of the United States formerly bred over vast areas in the Northwest and at intervals migrated in immense swarms for hundreds of miles beyond its usual habitat. In 1818 and 1819 that part of the country now known as Minnesota was covered by vast swarms; in 1820 the western part of Missouri was ravaged; in 1842 they again appeared in Minnesota and Wyoming, and in 1845 in Texas and again in 1849. They appeared in Utah nearly every year from 1851 to 1877, and a portion of Utah at one time was included in the permanent breeding-grounds of this species. An unusual locust year was 1856, when the insects swarmed over Kansas and Nebraska, the western counties of Missouri and northeastern Texas, and in Iowa, Minnesota, Colorado, and Utah. In 1870 to 1871 they again began to increase, and in 1873 were very injurious. The most disastrous locust year known in the United States, however, was 1874, when enormous swarms invaded the settled portions of the Mississippi Valley west of the ninety-fourth meridian. Colorado, Nebraska, Kansas, Wyoming, Dakota, Minnesota, Iowa, Missouri, New Mexico, Indian Territory, and Texas were overrun by swarms from the Northwest, mainly from Montana and British America. The loss in this region was estimated at $50,000,000 in the actual destruction of crops. In 1875 the young insects hatched in immense numbers over an area embracing portions of Nebraska, Kansas, and Missouri, entailing destitution and suffering among a population of 750,000 people. In 1877 the young insects died in great numbers, and those which acquired wings flew toward the Northwest in the direction of Dakota and Montana, the region of the permanent breeding-grounds. The district in which the insect was considered to breed permanently was mapped by the United States Entomological Commission in 1877. It was stated that the area comprised about 300,000 square miles. The most favorite breeding-places in this area were the river bottoms and the sunny slopes of uplands or the grassy regions among the mountains. At the same time a 'sub-permanent' breeding region in which the insects breed more or less continuously was also mapped out. When the Entomological Commission finished its labors in 1879 these conclusions were practically confirmed. Since that time, however, much of that region has been greatly changed in character by settlement and by the introduction of agriculture. The result has been that the permanent breeding-grounds of the Rocky Mountain locust have been greatly restricted, and in fact it has practically been driven beyond the borders of the United States, and now breeds freely only in portions of British Columbia. From those grounds, however, occasional swarms fly south into the Northwestern

States and do more or less damage for a single season, as has been the case in restricted localities in Minnesota and North Dakota the past few years.

The eggs of locusts are usually laid in the ground. With the Rocky Mountain species from twenty to thirty-five are laid together in a compact mass covered with a pod. The locust itself occupies seven weeks from the time of hatching in attaining its full growth. The locusts of the Old World have been known to fly to Central Europe from their permanent breeding-grounds in Central Asia. In North America they often extend their flights over a distance of from one thousand to two thousand miles, or from Montana to Missouri, and even to Texas. Flight takes place during the day and ends toward sundown. The rate of travel varies from three to twenty miles an hour, depending upon the wind. The height at which the migrating swarms move differs greatly, according to the direction and height of the air-currents. They have been noticed, for example, flying far above the summit of Parry's Peak, an elevation of more than thirteen thousand feet.

The best measures advised for their destruction are harrowing and late fall plowing for the destruction of the eggs, crushing of the newly hatched individuals between rollers, and especially the collecting of the young individuals by an apparatus consisting primarily of a coal-oil pan either dragged along the ground or mounted upon wheels. Of late years a good remedy has been discovered in the use of a mash of bran and arsenic, which is distributed in little moist masses about the infested fields. The locusts are fond of this mixture, and it is fatal to them. Good results have been reached in South Africa, and to a much lesser degree in the United States, during the past few years, by distributing a pathogenic fungus of the genus Sporotrichum, which kills the locusts when they occur in swarms. Locusts are also subject to several other diseases; there is a fungus of the genus Mucor which undoubtedly kills them, and another (*Empusa grylli*) frequently destroys them in great numbers. They have many natural enemies among birds and parasitic insects, including hairworms (see Hairworm), and insects that devour their eggs. Locusts are eaten in many countries, roasted or fried in butter. They are also preserved in brine or dried in the sun. They thus appear in the markets of Arabia, Syria, Egypt, and Madagascar, and are even exported as an article of commerce. They are also candied and eaten as a delicacy in China, and in the Philippines they frequently form an important article of diet among the poorer classes.

Consult the First, Second, and Third Reports of the United States Entomological Commission (Washington, 1877, 1879 and 1882); also Munro, *The Locust Plague and Its Suppression* (London, 1900).

LOCUS′TA, or LUCUS′TA. A female poisoner at Rome, used by Agrippina to poison Claudius and by Nero to destroy Britannicus. For the latter deed she was rewarded by Nero, but was executed under the Emperor Galba.

LOCUST-BIRD. A bird notable for feeding upon locusts; especially a South African grakle (*Creatophora carunculata*). In the same region a white stork is called 'great' locust-bird, and one of the pratincoles (*Glareola Nordmanni*) 'little' locust-bird. The great swarms of locusts that frequently visit the South African plains are followed and attacked by the pratincoles in revolving flocks; their very curious actions are described at length by Layard, in *Birds of South Africa* (London, 1867). In India the name is suitably given to a starling, the familiar rose-colored pastor. See Pastor.

LOCUST-TREE. A name given to various trees of the natural order Leguminosæ. The carob-tree (*Ceratonia siliqua*) is often so called in the countries bordering on the Mediterranean. The locust-tree of America (*Robinia pseudacacia*), also called the false acacia or thorn-acacia, and on the Continent of Europe very generally the acacia, is valuable. It is of rapid growth and is very ornamental, especially when in flower. On account of its rapid growth, spiny branches, and ability to withstand trimming, it is considered a valuable hedge tree. Its generic name is derived from John Robin, who is said to have introduced the tree into France about the year 1600. It succeeds well as a forest tree in Europe except in the North, where it suffers from frost. Locust-wood is compact, hard, takes a good polish, and is useful for all purposes in which great strength and especially toughness is required, a quality which makes it valuable in ship-building, for which large quantities are used. It is also valuable for making the cogs of wheels. In the United States the Robinia attains its best development in Kentucky, Tennessee, and vicinity, where in rich soil it reaches 70 to 80 feet and 3 feet in diameter. The tree is especially subject to insect injuries, on which account it is often condemned. The honey-locust tree of America is a Gleditschia. The locust-tree of the West Indies (*Hymenæa courbaril*) is a gigantic tree, whose pods supply a mealy nutritious substance in which the seeds are imbedded. It is sweet

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and pleasant, but reputed as inducing diarrhœa when recently gathered. A fermented decoction is used as beer. See Carob; Honey-Locust; and Plate accompanying Lime-Tree.

LOCUST-TREE INSECTS. The insects that attack the locust (*Robinia pseudacacia*) are numerous, and the tree suffers from some of them very seriously in certain parts of the United States. Forty-one species of insects feeding upon this tree are treated in Packard's *Report on Forest Insects.* Of those which affect the trunk, the locust-borer, the larva of a long-horned beetle (*Cyllene robiniæ*), is one of the most important. It is a black beetle with yellow transverse bands, and, like its near relative (*Cyllene pictus*) which infests the hickory, has a superficial resemblance to certain wasps, and has thus been cited as a case of protective mimicry. Another borer, the larva of a sesiid moth (*Sciapteron robiniæ*), is destructive to locust-trees as well as to poplars on the Pacific coast; and the locust twig-borer (*Ecdytolopha insiticiana*) causes a thickened growth of certain twigs for a distance of from one to three inches. The adult of this species is a tortricine moth. (See Leaf-Roller.) Many of the leaf-feeders are leaf-rollers and leaf-miners, but the larva of a very striking butterfly known as the 'locust-skipper' (*Eudamus tityrus*) has this habit also. A leaf-mining beetle (*Odontota scutellaris*) disfigures the leaves with its larval mines throughout the Eastern States. The larva of the locust saw-fly (*Nematus similaris*) feeds upon the leaves and occasionally defoliates trees. Consult Packard, *Fifth Report of the United States Entomological Commission* (Washington, 1890).

LODE (AS. *lād*, way, course, from *līpan*, Goth. *leipan*, OHG. *līdan*, to go, to travel). A miners' term for veins in which minerals occur. They are crevices, more or less vertical, produced by contraction or mechanical disturbance of the rock, which have subsequently been filled with metallic ores. See Ore Deposits; Mining; Comstock Lode.

LO-DE'BAR. A place in Gilead which (if the reading be correct) was the residence of Machir, son of Ammiel, with whom Jonathan's son, Mephibosheth, lived at the beginning of David's reign (II. Sam. ix. 4-5). Machir and Lo-debar are mentioned again in chapter xvii. 27 in connection with David's flight in consequence of Absalom's rebellion. Probably the same place is meant in Joshua xiii. 26 (cf. Revised Version, margin), and some authorities think it is referred to in Amos vi. 13. The location has not been identified. A village, Idbar, seven miles east of Mkes (Gadara) has been suggested.

LODEMAN, lō'de-măn, Ernest Gustavus (1867-96). An American horticulturist and author. He was born in Neuchâtel, Switzerland, but came to America with his parents in 1870, his father having been appointed professor of modern languages in the Michigan State Normal School. He was graduated from the Agricultural College of Michigan in 1889. In 1890 he became assistant to Prof. L. H. Bailey in Cornell University and shortly afterwards instructor in that institution. While there he originated the spray calendar, a placard which gives in concise form approximate dates for spraying insect and fungous enemies of various crops, together with formulæ for preparing the principal fungicides and insecticides. He also published the results of many investigations in bulletins of the Cornell Agricultural Experiment Station. *The Spraying of Plants* (New York, 1896), his only book, was prepared after comprehensive field work, and embraces not only the results of his exhaustive studies at home and abroad, but all that was then considered valuable on the subject.

LODER'S GAZELLE. See Gazelle.

LODESTAR, LOADSTAR (*lode*, AS. *lād*, way, course + *star*), Leading Star, or Guiding Star. Terms applied to the Pole-star, which is the last star in the tail of the Little Bear. It is a star of the second magnitude, located about 1° 20′ from the North Pole.

LODESTONE, or **LOADSTONE.** See Magnetite.

LODÈVE, lō'dĕv'. The capital of an arrondissement in the Department of Hérault, France, situated in a beautiful valley on the Ergue, 36 miles northwest of Montpellier by rail (Map: France, K 8). It retains its mediæval walls and has a cathedral dating from the thirteenth century. It is noted for its manufactures of army clothing and woolens. Lodève is the Gallic Luteva and the Roman Forum Neronis. Previous to the Revolution it was the seat of a bishop. Cardinal Fleury was a native of Lodève. Population, in 1900, 8200.

LODGE, Edmund (1756-1839). An English biographer and historian, born in London. He held various heraldic positions, and his studies in that field include: *Illustrations of British History, Biography, and Manners in the Reigns of Henry VIII., Edward VI., Mary, Elizabeth, and James I.* (1791), a selection from contemporary manuscripts in the College of Arms; *Portraits of Illustrious Personages of Great Britain* (1814), a work costing more than £40,000; and *The Genealogy of the Existing British Peerage* (last ed. 1859). *Lodge's Peerage* is not Lodge's work; he merely lent his name to the compilers, the Misses Innes.

LODGE, Gonzales (1863—). An American classicist, born at Fort Littleton, Pa. He received the bachelor's degree from Johns Hopkins in 1883, and his doctorate in 1886. From 1889 to 1900 he was professor of Latin in Bryn Mawr, and afterwards became professor of Greek and Latin in the Teachers College at Columbia University. He was joint author of the Gildersleeve-Lodge *Latin Grammar* (New York, 1894); editor of Plato's *Gorgias* (Boston, 1891); and was also made managing editor of the Gildersleeve-Lodge *Latin Series.* In 1902 his great *Lexicon to Plautus* began to appear in parts.

LODGE, Henry Cabot (1850—). An American politician, orator, and man of letters, born in Boston, May 12, 1850. He was graduated from Harvard College in 1871 and from the Law School of Harvard University in 1875. From 1873 to 1876 he edited the *North American Review,* and the following three years was lecturer on American history at Harvard. He then (1879) became editor of the *International Review,* which post he held till 1881. About this time he entered political life; besides serving in the Massachusetts Legislature, 1880-81, he was a delegate to the Republican National Conventions of 1880 and 1884. In 1886 he was elected to the National House of Representatives.

He was reëlected in 1888, and in 1893 succeeded Mr. Dawes as United States Senator from Massachusetts. He was reëlected in 1899. As a politician he early became prominent for his insistence upon laws to safeguard the franchise and upon the necessity for the restriction of immigration by the requirement of educational qualifications. During the Spanish-American War he strongly supported the Administration. He became a member of the Committee on Foreign Relations. From his pen we have a *Short History of the English Colonies in America* (1881); *Studies in History* (1884); *Certain Accepted Heroes* (1897); *The Story of the American Revolution* (1898); and *The War with Spain* (1900). He also published the *Life and Letters of George Cabot* (1877) and a volume of *Essays on Anglo-Saxon Land Laws*, and edited the works of Alexander Hamilton (1885). The "American Statesmen Series" owes to him the lives of Hamilton, Webster, and Washington.

LODGE, Sir OLIVER JOSEPH (1851—). An English physicist. He was born June 12, 1851, at Renkhull, Staffordshire. At the completion of his grammar school education he at first entered upon business life, but by studying evenings he was able to matriculate and pursue courses at the University College, London, where he received the degree of B.Sc., taking honors in physics. After further study in Prof. Carey Foster's laboratory, he received the degree of D.Sc. and became assistant professor of physics at the University College, London. Upon the establishment of the University College at Liverpool, Lodge was appointed professor of physics (1881), and was connected with that institution until 1900, when he became principal of the University of Birmingham. He was knighted in 1902. Professor Lodge's researches have been mainly in electricity, and he has carefully investigated many subjects connected with alternating currents, lightning discharges, and the physics of the ether. In the course of his experiments with lightning conductors he was able to discover oscillations and waves in conductors, and as he was seeking to demonstrate Maxwell's theoretical observations, it is more than probable that he would have observed these waves in air if he had not been anticipated by Hertz (q.v.). However, he discovered that these waves would cause filings of metals to cohere or alter their arrangement and electrical resistance, and was thus able to construct the *coherer*, which plays so important a part in wireless telegraphy (q.v.). This invention was also made independently by Edouard Branly, of Paris, but Lodge's work in this field was followed by other discoveries which brought about substantial advances in wireless telegraphy. His researches on lightning led to the revision of many ideas which have long been held on this subject, and his work on *Lightning Conductors and Lightning Guards* is considered one of the most valuable works in this department. He has written many papers on physics and electricity, and is the author of the following books: *Elementary Mechanics* (1877); *Modern Views of Electricity* (1889); *Lightning Conductors and Guards* (1892); *Pioneers of Science* (1893); and *The Work of Hertz and His Successors.*

LODGE, THOMAS (c.1558-1625). An English author, born in or near London; graduated B.A. from Trinity College, Oxford (1577); admitted as law student at Lincoln's Inn (1578); after some experience in the army, made voyages to the Canaries (1588) and to South America (1591); studied medicine, it is said, at Avignon (1600), and was incorporated M.D. at Oxford (1602). He died in Old Fish Street, London. His chief writings comprise: *A Defence of Plays* (1580), a sharp retort to Stephen Gosson's *School of Abuse; An Alarum Against Usurers* (1584); two plays, *The Wounds of Civil War* (1594), and, in conjunction with Robert Greene, *A Looking Glass for London and England* (1594); several romances, among which are *Rosalynde*. (1590) and *Life of William Longbeard* (1593); translations of Josephus (1602) and of Seneca (1614); *Glaucus and Scilla* (1589, in a volume entitled *Scillæs Metamorphosis*), probably the model of Shakespeare's *Venus and Adonis; A Fig for Momus*, a collection of satires, epistles, and eclogues (1595); and a choice volume of poems called *Phillis* (1593). Lodge was one of the most graceful lyricists of the Elizabethan period. His *Rosalynde*, a beautiful pastoral, interspersed with some of his best verse, was dramatized with changes and additions by Shakespeare in *As You Like It*. Consult *Works*, all but translations, edited by Gosse for the Hunterian Club, Glasgow (4 vols., 1878-82); Jusserand, *English Novel in the Time of Shakespeare* (Paris, 1890).

LODGED (from *lodge*, OF., Fr. *loger*, to house, from *loge*, lodge, from ML. *lobia, lobium, laubia*, portico; ultimately connected with Eng. *lobby*). In heraldry, a term applied to a beast of chase, as a stag, when lying down with its head erect; a beast of prey in the same position is said to be couchant. See HERALDRY.

LODGING-HOUSES. Houses which provide shelter for homeless people. The rapid and continuous increase of the floating population in large cities, due to the steady drift of low-grade labor to the cities, has accentuated the problem of lodging-houses as distinguished from the tenement problem. This undomiciled population is a fruitful cause of disorder. At first America attempted to solve the problem by allowing the homeless to find shelter in the police stations. The buildings were ill-adapted for the purpose, decent sanitary conditions usually impossible, and the general situation so demoralizing to the self-respecting laborer that the practice is now forbidden in most cities. Various rescue missions have conducted houses, often furnishing a free breakfast in addition to the night's lodging. In all the large cities there are many places where lodging and breakfast can be had for a pittance; but these places are run for gain, and conditions are often very bad. New York has some 105 such houses, with beds to accommodate 16,000.

There is a general sentiment that decent accommodations should be furnished the homeless, and in most cities efforts are being made to substitute sanitary houses for the filthy accommodations now so common. The most striking examples in this country of model lodging-houses are the two Mills hotels, in lower New York City, conducted by D. O. Mills. They accommodate 2250 men. Each lodger has a private room at a cost of twenty or forty cents per night, with the privilege of free baths and use of laundry. Large, well-equipped reading, writing, and game rooms are provided. The enterprise has paid a fair return on the capital invested.

Boston, New York, Chicago, and other cities have established municipal lodging-houses, where those who cannot pay for shelter may obtain lodging and breakfast in return for a few hours of labor, usually sawing and splitting wood. An agent investigates the stories of the men and assists in securing regular employment. No one may remain more than two or three nights consecutively without a good excuse. In several cities, as Philadelphia and New York, similar institutions are maintained by charity organization societies, Salvation Army, etc. In some of the Salvation Army shelters a charge of ten cents is made for lodging in a dormitory, and fifteen cents for a separate room, bread and coffee being furnished for breakfast.

Most of the British municipalities have lodging-houses. On the Continent Paris conducts three establishments (*refuges de nuit*) absolutely free to lodgers, giving soup at night and bread in the morning and assisting in finding employment. In Germany there are many private institutions, often carrying on some simple manufacture (brooms, etc.), at which homeless men and women may find shelter and a chance to work. The Christliche Hospize in the larger cities provide comfortable shelter at very low cost to working men. See Housing Problem.

Consult: *Charities Review*, vol. i., pp. 22-26 (New York, periodical); "Model Lodging-Houses," *Review of Reviews* (January, 1897); "Floating Populations," *Annals of the American Academy of Social and Political Science*, vol. x.; Riis, *The Children of the Poor* (New York, 1892).

LODGINGS. Furnished rooms or apartments which are let to such persons as are satisfactory to the proprietor by special agreement, and in which the lodger gets no property right or interest, but merely the privilege of use and occupation under the terms of his contract. The relation of landlord and tenant does not exist between a keeper of lodgings and a lodger. One of the important distinctions is that a lodger has merely a personal action for breach of contract against the proprietor of the lodgings in case the latter evicts him contrary to their agreement, and in the absence of statute is not entitled to notice to quit; whereas a tenant can enforce his property rights by an action to recover the actual possession of the premises if he is wrongfully evicted by his landlord or any other person. Unless particular rooms or apartments are specially designated in the agreement between the proprietor and a lodger, the latter may be assigned or changed to any room in the same house of the general character and class as that for which he bargained. The proprietor of lodgings is not obliged to receive every person who applies to him, but may select his lodgers as he sees fit, and make such terms as may be satisfactory to both parties, irrespective of his terms as to other lodgers. He is not absolutely responsible for the baggage and effects of his lodgers, but is only liable to take the ordinary care of them which a reasonable person would take of his own goods. In the absence of statute he has no lien on the property of the lodgers in his house for the amount due him, but in New York and several other jurisdictions, lodging-house and boarding-house keepers possess such a lien. In the above respects a proprietor of a lodging-house differs from an innkeeper, who is bound to receive all proper persons who apply for meals and lodgings, and who is an absolute insurer of the safety of the baggage and other effects of his guests. The keeper of a lodging-house has the legal possession, care, and custody of his whole house and every room; and it has been held that a lodger could not maintain an action against a stranger who invades his room, as that right is in the proprietor. The same rules apply where the owner of a private house lets out one room as where a house is exclusively devoted to the purpose. A lodging-house differs from a boarding-house in that no meals are furnished to the lodgers as such. Boarders are, however, usually lodgers also, and therefore the former term is popularly employed to designate one who is entitled to meals and lodgings at the same house. See Boarding-House; Inn, Innkeeper; Landlord and Tenant; Lien; and consult the authorities referred to under Contract; Bailment, etc.

LODI, lŏ′dê. A city in the Province of Milan, Italy, 20 miles southeast of the city of Milan, on the Adda (Map: Italy, D 2). It has a cathedral erected in 1158, containing numerous sculptures, and the fine Church of the Incoronata, an edifice in the Renaissance style, and adorned with valuable paintings by Calisto Piazza da Lodi. The district is one of the most extensive cheese-producing centres in the world; the manufactures include linen and woolen goods, silk, and cement. Here, on the 10th of May, 1796, Napoleon gained his celebrated victory over the Austrians which gained for France the possession of Lombardy. Population, in 1901 (commune), 27,811.

LOD′OME′RIA. The Latin name of a mediæval Slavic principality, whose history forms part of that of Galicia. See Galicia.

LODZ, lôj. The capital of the district of Lodz, in the Government of Piotrkow, and next to Warsaw the most important town in Russian Poland. It is situated on the Ludka, 87 miles by rail southwest of Warsaw, and occupies with its recently incorporated suburbs an area of nearly 11 square miles (Map: Russia, A 4). It is primarily a manufacturing city, devoid of any architectural beauty. It is well supplied with educational institutions, which include two gymnasia, a technical institute, three theatres, and several libraries. In the manufacturing of textiles Lodz holds the foremost position in Russian Poland. The industry is of comparatively recent origin, the first textile mills having been founded there in 1815. At present there are at Lodz upward of 400 establishments, employing more than 40,000 persons, and having an annual output valued at $35,000,000. Cotton goods and woolens are the principal products, but there are also manufactured linen, silk goods, machinery, boilers, etc. The textile industry is chiefly in the hands of the Germans, to whom the city is mainly indebted for its present position. In 1860 Lodz had only 32,600 inhabitants; in 1885, 113,413; and in 1897 it increased its population by the annexation of the manufacturing suburbs to 315,200. The majority of the inhabitants are Germans or of German descent. The Jews number over

40,000, while the number of Russians is comparatively insignificant.

LOEB, lẽb, Jacques (1859—). A German-American physiologist and experimental biologist. He graduated from the Ascanisches Gymnasium in Berlin; studied medicine at Berlin and Munich, receiving the degree of M.D. at Strassburg in 1884. He was appointed State Examiner at Strassburg in 1885, was assistant in physiology at the University of Würzburg in 1886-88, and held a similar position in the University of Strassburg in 1888-90. He made researches in animal physiology at the Naples Zoölogical Station in 1889-91. He was appointed associate professor of biology at Bryn Mawr College, 1891-92; was then (1892) called to Chicago University as assistant professor of physiology and experimental biology; and in 1895 was appointed associate professor. In 1902 he was elected professor of physiology in the University of California. Professor Loeb's work has been in the line of comparative physiology and psychology. He is the pioneer in the study of the physiology of protoplasm, i.e. of cells and tissues, including the effects of salt solutions on the muscles of the heart in different animals. He has made ingenious experiments on the mechanism of the reflex activities of the lower animals, with especial relation to the different kinds of tropisms and the mode of orientation of organisms. Although the true basis of instinctive acts as inherited reflexes was first pointed out by Herbert Spencer, Loeb has done much by his experiments to show the slight line of demarcation existing between the lower instincts and reflex actions. He has also made notable contributions to other problems in physiological psychology. One of his latest researches is that on the artificial production of parthenogenesis by adding salt solutions (chloride of magnesium) to sea-water. His essays have appeared chiefly in Pflüger's *Archiv*, and in *The American Journal of Physiology.* Among them are: *The Heliotropism of Animals and Its Identity with the Heliotropism of Plants* (1890); *Physiological Morphology* (vol. i. 1891; vol ii. 1892); *Introduction to the Comparative Physiology of the Brain and Comparative Psychology* (1899); "Experiments on Artificial Parthenogenesis in Annelids, and the Nature of the Process of Fertilization," in *American Journal of Physiology*, vol. iv. (1901). In his book *Comparative Physiology of the Brain and Comparative Psychology* (1902) will be found the titles of other papers.

LOEB, Louis (1866—). An American figure painter and illustrator, born in Cleveland, O. He was a pupil of Gérôme in Paris, and afterwards settled in New York City and became an associate of the National Academy of Design, and a member of the Society of American Artists in 1900. His subjects are usually landscapes, with figures, treated in an agreeable, decorative manner, with considerable poetic feeling. His works include: "Temple of the Winds" (1898); "The Breeze" (1900); "The Joyous Life" (1902); and "The Dawn" (1903), which won the Webb prize. He also received honorable mention at the Salon of 1895 and a third-class medal at the Salon of 1897.

LOEBELL, lẽ'bel, Johann Wilhelm (1786-1863). A German historian, born in Berlin, and educated at Heidelberg and at Berlin under Wolf and Böckh. From 1814 to 1829 he taught in the military academies at Breslau and Berlin, and then became professor of history at Bonn. His best-known work is the revision of Becker's *Weltgeschichte* (1836-38). He also wrote *Gregor von Tours und seine Zeit* (2d ed. 1869); *Weltgeschichte in Umrissen und Ausführungen* (Part I., 1846); *Die Entwicklung der deutschen Poesie von Klopstocks erstem Auftreten bis zu Goethes Tode* (1856-65) and an anonymous attack on Ultramontanism, *Historische Briefe* (1861). Consult Bernhardt and Noorden, *Zur Würdigung Loebells* (Brunswick, 1864).

LOENING, lẽ'nĭng, Edgar (1843—). A German jurist, born in Paris and educated at Bonn, Heidelberg, and Leipzig. He was appointed to chairs of law at Strassburg in 1872, at Dorpat in 1877, at Rostock in 1883, and at Halle in 1886. His publications include: *Geschichte des deutschen Kirchenrechts* (1878); *Die Haftung des Staates aus rechtswidrigen Handlungen seiner Beamten* (1879); *Die Befreiung des Bauernstandes in Deutschland und Livland* (1880); and *Repräsentativ-Verfassung im neunzehnten Jahrhundert* (1900).

LOENING, Richard (1848—). A German jurist, brother of Edgar Loening, born in Frankfort and educated at the universities of Heidelberg and Berlin. In 1878 he was made professor extraordinarius and in 1882 professor ordinarius at Heidelberg. He wrote: *Der Vertragsbruch im deutschen Recht* (1876); *Der Reinigungseid bei Ungerichtsklagen im deutschen Mittelalter* (1880); *Grundriss zu Vorlesungen über deutsches Strafrecht* (1885); and *Die Hamlet-Tragödie Shakespeares* (1893).

LOESS, lẽs (Ger.). A loamy or sandy deposit of Pleistocene age, occurring in many parts of the world. It was first described as occurring in the Rhine Valley, but it is now known to cover large areas in Central Europe, in the western half of the United States, and in China. Its general character is that of a very fine-grained homogeneous sand, with very little clay, but often calcareous. In the United States and China the deposits attain great thickness, 250 feet or more, and where cut into by rivers like the Mississippi or Hoang-ho they form high cliffs. Loess affords a fine fertile soil, especially when charged with organic matter, but, owing to its porous nature, it requires abundant moisture. The origin of loess has been variously explained. Where the material lies in river valleys it is undoubtedly due to stream deposition, this having probably occurred in glacial or post-glacial times, when the waters contained much fine sediment derived from the melting ice. Where, however, it covers vast areas, a different mode of origin must be sought. Many geologists consider that much of the loess of the Great Plains region was deposited in glacial lakes; Richthofen believes that the loess of China is of æolian origin. The fact that shells of land-snails are occasionally found in the American loess leads some geologists to claim a similar origin for at least portions of it. A material resembling loess, called adobe, is found in many valleys of the far West. It is a calcareous clay, derived from the disintegration of rocks on the valley slopes. The chief economic value of the loess is for brick-making. When irrigated it forms an unusually productive soil.

Consult: Chamberlin and Salisbury, "The Driftless Area of the Upper Mississippi Valley," *Sixth Annual Report of the United States Geological Survey* (Washington, 1888); Sardeson, *American Journal of Science*, vol vii., Fourth Series, p. 58 (New Haven, 1899); McGee, "The Pleistocene History of Northeastern Iowa," in *United States Geological Survey, Eleventh Annual Report* (Washington, 1891).

LOESSING, lĕs'sĭng, Herman. The secular name of José de Jesû Maria Ignacio (q.v.).

LOEWE, lẽ've, Karl. See Löwe, Karl.

LOEWE, Wilhelm (1814-86). A German Liberal politician, also called Loewe-Kalbe. He was born at Olvenstedt, near Magdeburg, was educated at Halle, and became a practicing physician. In 1848 he was elected to the Frankfort Parliament, was a prominent member of the extreme Democratic Party, was soon chosen first vice-president of the Parliament, and, after its removal to Stuttgart, was made president. At first acquitted on the charge of sedition for his part in this revolutionary movement, he was finally sentenced *in contumaciam* to life imprisonment. He spent several years in Switzerland, Paris, and London, and then practiced medicine for eight years in New York. In 1861 he benefited by the amnesty and returned to Germany. Two years later he was elected to the Prussian House of Deputies, and in 1867 to the North German Reichstag as a member of the Progressist Party. In 1874 he quarreled with his party on the military law of that year, and tried to form with other independents a Liberal Party which would agree in political matters with the Progressist Party, but would be free on economic questions. In carrying out this policy, he eagerly defended the protective tariff of 1879. He was defeated for reëlection in 1881.

LOEWY, lẽ'vẽ', Maurice (1833—). A French astronomer, born in Vienna. He studied astronomy in his native city, but was later called to Paris by Leverrier, who offered him a position in the observatory there. In 1872 he became a member of the Bureau des Longitudes, and the next year succeeded Delaunay in the Academy of Sciences. After Leverrier's death he was associated with Admiral Mouchez in the management of the observatory of Montsouris. He devised the *équatoréal coudé;* and, in addition to editing the *Connaissance des temps* and the *Annuaire du Bureau des longitudes*, made frequent contributions to the Memoirs of the academies in Paris and Vienna. In 1878 he was appointed subdirector of the Paris observatory.

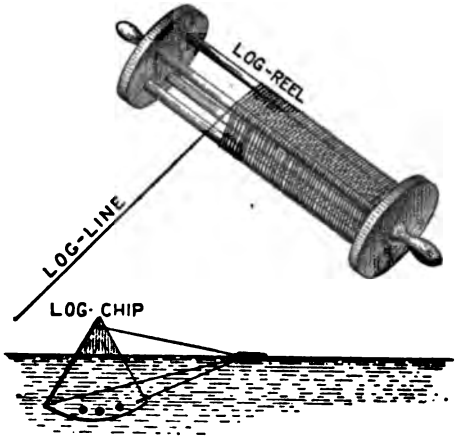
LÖFFTZ, lĕfts, Ludwig (1845—). A German painter, born at Darmstadt. He was a pupil of Kreling and Raupp at Nuremberg, then of Diez at the Academy in Munich, where he became professor in 1879, and of which he was director in 1891-99. His works are not numerous, but are of great perfection. A lofty atmosphere pervades his interiors, treated in the spirit of the Flemish masters, while his religious subjects are imbued with deep feeling and solemn grandeur. Great technical skill and masterly treatment of the chiaroscuro produce the most harmonious effects in all his paintings, which include: "Cardinal Playing the Organ" (1876), a likeness of Franz Liszt; "Avarice and Love" (1879, in the collection of W. H. Vanderbilt, New York), suggestive of Quentin Massys; and "Erasmus in His Study" (Stuttgart Museum). The impressive "Pietà" (1883) won for him the gold medal at the International Exhibition in Munich, and is now in the New Pinakothek, which also contains "Eurydice" (1898). For the Cathedral at Freising he painted a large altarpiece, "Assumption of the Virgin" (1889).

LO'FOTEN, or **LOFODEN**. A chain of islands extending about 175 miles in a southwest direction from the northwestern coast of Norway (Map: Norway, E 2). It comprises the Lofoten proper and the Vesteraalen Islands, to the north. The archipelago consists of several large islands and innumerable small islets and rocks. The largest islands are Hindö, Langö, Andö, Oest-Vaagö, Vest-Vaagö, and Moske-næsö, of which the first three belong to the Vesteraalen group. Hinnö, which lies nearest to the mainland, has an area of 850 square miles. They are extremely irregular in outline, being indented with numerous narrow and winding fiords, and consist of masses of rocks torn asunder to an extraordinary degree, rising abruptly from the deep water in precipices and needle-shaped crags often over 1000 feet high. The mountains rise in Hindö to a height of 3600 feet. The tidal currents in the narrow channels separating the islands are in some places so swift as to make navigation difficult even for steamers. (See Malström.) The interior of the islands is mostly barren and uninhabited, though the eastern portions of Hindö are covered with forests, and some of the sheltered valleys support a little agriculture and sheep-raising, as the climate is not severe in spite of the high latitude (68°-69°). The inhabitants, who in 1900 numbered 42,817, live along the coasts in isolated farm-houses or in small fishing villages. The cod-fisheries are the main support of the islands, as well as of thousands of fishermen from the mainland who brave these dangerous waters every year from December to March. These fisheries have been famous for centuries; they are an important source of national wealth, and are among the richest in the world.

LOFTUS, lŏf'tŭs, Augustus William Frederick Spencer, Lord (1817-1904). An English diplomat, fourth son of the Marquis of Ely. Educated by private tutors and at Eton and Cambridge, he entered the diplomatic corps in 1837 as attaché at Berlin and later at Stuttgart (1844). In 1848 he was secretary to Sir Stratford Canning on the Radcliffe special mission to the European courts. Four years afterwards he became secretary of legation at Stuttgart and in 1853 held a like post at Berlin. In 1858 he was Envoy at Vienna, in 1860 at Berlin, and in 1862 at Munich; as Ambassador he served at Berlin (1865), as agent to the North German Confederation (1868-71), and then at Saint Petersburg (1871-79). After six years as Governor of New South Wales, Loftus was retired in 1885. He published *The Diplomatic Reminiscences of Lord Augustus Loftus* (1892-94).

LOFTUS, William Kennett (c.1821-58). An English archæologist, born at Rye in Sussex. He was educated at Cambridge, and from 1849 to 1852 made extensive explorations on the sites of the ancient cities on the Tigris and Euphrates. In 1853-55, under the auspices of the Assyrian Excavation Fund, he made particular examination of Nineveh and Babylon, returning with highly valued collections for the British Museum. He published *Travels and Researches in Chaldæa* *and Susiana* (1857); and contributed to the *Quarterly Journal of the Geological Society* and to the *Journal of the Royal Geographical Society.*

LOG (Swed. *logg,* Dan. *log,* ship's log; ultimately connected with Eng. *log,* felled tree, and with Icel. *liggja,* AS. *licgan,* Eng. *lie*). An apparatus for ascertaining the speed of a ship through the water. Logs are of two kinds, the old-type *chip log* and the *patent* or *taffrail log.* The former consists of the *log-chip, log-line, reel,* and *time-glass* (14-second or 28-second). The *chip* consists of a piece of board about half an inch thick and cut in the shape of a quadrant of a circle of about six inches radius. Along its curved edge there is a groove filled with lead to ballast it and assist to keep it vertical, and near each angle there is a hole. In the holes at the ends of the circular arc are passed the ends of a small piece of rope which are knotted on the other side to keep them from pulling through. In the middle of this piece of rope is seized a wooden plug called a toggle. The end of the log-line is passed through the other hole in the chip and similarly knotted; on the log-line there is secured a piece of wood with a hole or socket in it for the toggle, and its distance from the chip is such that when the toggle is inserted the three lines hold the chip horizontal if the log-line is held vertically. The log-line consists of a small rope (untarred hemp usually) about one-quarter of an inch in diameter and 150 fathoms long, and is wound upon a reel fitted to turn easily upon its axis, which protrudes beyond the reel to form handles by which it is held.

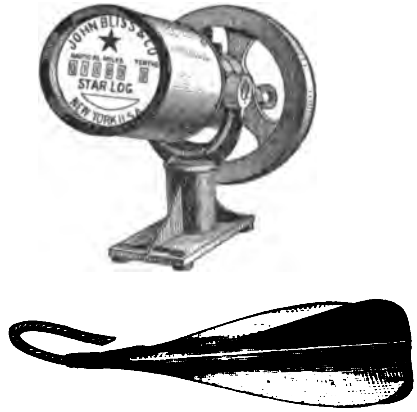


CHIP LOG.

The log-line is marked as follows: For a certain distance from the chip, usually about 20 fathoms, there are no marks; this is called the *stray-line* and must be long enough to let the chip get well clear of the eddies at the stern of the ship. The end of the stray-line is marked with a white rag. From that measure off the length for one knot (about 47 feet 3 inches for a 28-second glass) and mark it with a piece of cord worked into the lay of the rope and having one knot tied in its end; the second knot is marked with a similar piece of cord (usually hard-twisted fish-line) having two knots on it, and so on. Each knot is subdivided and marked at every two-tenths with a small piece of cord without knots.

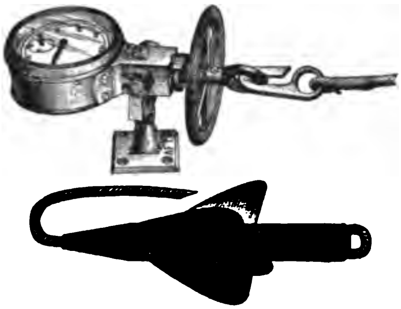
The time-glasses are shaped like the conventional hour-glass and filled with a black sand which should be kept dry and free-running. To heave the log requires at least two persons, preferably three or more if the ship is going over four knots. One man holds the reel and another the glass; after throwing the log-chip (the toggle pressed firmly into the socket) over the stern he waits for the white rag at the end of the stray-line to pass over the ship's rail; if the reel does not work easily he assists it by pulling on the line, for no strain must come on the chip, nor must the line lie slack in the water. When the white rag crosses the rail he turns the glass quickly or directs another man to do so—if there is a third—and when the sand is out the person holding the glass calls '*Up!*' The line is grasped and held and the number of knots and tenths which have run out is noted. The pressure of the water against the chip when the line is held causes the toggle to pull out of the socket; the chip then lies flat on the water and the line is easily drawn in. When the line is properly marked, the glass in good order, and the heaving of the log carefully done, the result should not be in error more than two-tenths of a knot and should average less. But it must be remembered that this method only determines the speed at a particular moment, and this may not be the average speed during the interval for which the speed is desired.

A *patent* or *taffrail log* is very different in principle as well as in construction. It records the actual distance passed over by the ship and not the speed at any particular time. It consists of a register having three dials or other indicating devices, and appropriate gearing, a rotator which has a small body and blades like a propeller—but of greater proportional surface—and a log-line of hard braided untarred hemp connecting them. As the ship goes ahead, the rotator—which is a hundred yards astern—tends to twist the log-line; this in turn transmits the twisting motion to the register which, by suitable gearing, records the proper distance. In early types of taffrail logs there was a tendency of the log-line to twist until the inertia of the gearing was overcome and then the latter would buzz around for two or three seconds. In recent types this is avoided by a little fly-wheel on the shaft to which the line is attached; this makes the



BLISS PATENT LOG.

motion smooth and regular and adds to the accuracy of the instrument. The three dials usually fitted on the register record tenths of miles, miles, and tens of miles; thus if the dials show 6—4—8, the reading of the register is 64.8 miles. By reading the log at intervals the speed may be ascertained; the reading is usually recorded every hour in the ship's log-book (q.v.).



NEGUS PATENT LOG.

The log and line for determining the speed of ships is of comparatively recent origin. Purchas refers to it in 1607; but it was certainly not common before 1620. No record is to be found in any ancient writings of the means used by old navigators to estimate the speed of their ships. Bourne, writing in 1577, describes a design for a machine to record the speed of ships not unlike Massey's submerged log, which later had the rotator or propeller directly connected to the dial and the whole submerged and secured to a brace or trailing lines; it had to be hauled on board to read it, and this was a fatal defect, which soon caused it to be displaced by the taffrail log—indeed, it was never much used. Taffrail logs came into general use about 1875. On large steamers the revolutions of the propeller give a fairly accurate measurement of the distance passed over and of the speed; and if the weather is fair and sea not too rough the measurement is as accurate as that of any form of log, provided the corresponding speeds for various conditions of draught, trim, etc., have been determined. The difficulty of preparing tables in which the requisite information is embodied is usually such that the log is almost always used, the revolutions of the engine being recorded as a check on it in case it gets out of order or becomes fouled with seaweed.

In shallow waters when the currents are swift and variable a *ground-log* is used. In this case a light lead or other weight is hitched to the log-line instead of the chip. This sinks to the bottom and the speed of the vessel over the ground is ascertained instead of her speed through the water, and some idea of the direction she is making over the ground is also thus obtained.

LO'GAN. A village and the county-seat of Hocking County, O., 50 miles southeast of Columbus; on the Hocking River, and on the Columbus, Hocking Valley and Toledo Railroad (Map: Ohio, F 6). It is the centre of an extensive natural-gas field, and has foundries and machine-shops, flour-mills, furniture-factories, a pottery, and fire-proof and paving brick plants. The public library contains over 2000 volumes. There are municipal water-works. Population, in 1890, 3119; in 1900, 3480.

LOGAN. A city and the county-seat of Cache County, Utah, 60 miles north of Ogden; on Logan River, and on the Oregon Short Line Railroad (Map: Utah, B 1). It is the seat of the State Agricultural College, Brigham Young College (Latter Day Saints), opened in 1878, and New Jersey Academy (Presbyterian). The industrial establishments include saw-mills, a beet-sugar factory, brewery, and knitting-mills. Settled in 1859, Logan was incorporated in 1866 under an act of the Territorial Legislature, and is governed under a general act of 1898, providing for the government of cities in the State. The Mayor is biennially elected and has some appointive power, subject to the consent of the council, which is a unicameral body. The city owns and operates the water-works. Population, in 1890, 4565; in 1900, 5451.

LOGAN, or **LOGGAN.** See ROCKING STONE.

LOGAN, BENJAMIN (1752-1802). An American pioneer and Indian fighter. He was born of Irish parentage in Augusta County, Va., but at an early age crossed the Alleghanies and settled in Kentucky. There he was associated with Boone, Kenton, and others in almost constant Indian warfare, took part as a scout in Lord Dunmore's War (q.v.), and in the fighting between the frontiersmen and the British and Indians during the Revolution. In 1775 he built near Stanford, Ky., the stockade known as 'Logan's Fort,' which was besieged by the Indians in 1777, on which occasion he, with one companion, broke through the Indian lines and reached Holston, 150 miles away, where reinforcements were obtained. He took part in Colonel Bowman's expedition against the Shawnees at Chillicothe, and commanded the force sent in pursuit of Girty and his Indian allies. It was the precipitate haste of his advance guard that led to the bloody defeat at Blue Licks, Logan himself with the main body arriving on the scene the day after the battle. He was a member of the Kentucky Constitutional Conventions of 1790 and 1799, and served for several terms in the State Legislature.

LOGAN, CORNELIUS AMBROSIUS (1806-53). An American dramatist, born in Baltimore. After sailing as supercargo on several trips to England he became an editor of the Baltimore *Morning Chronicle*, and later an actor and dramatist. He appeared preferably in comedy, but also in tragedy, built at Philadelphia a theatre, later lost by fire, and in 1840 became a theatrical manager at Cincinnati. Among his plays are *Yankee Land* (1834), *The Way of Maine* (1835), and *The Wood Dealer*. His poem "The Mississippi" was at one time well known.

LOGAN, GEORGE (1753-1821). An American scientist and politician, born of Quaker parentage at Stenton, Pa. He studied medicine at Edinburgh for three years, and then traveled on the Continent, returning to America in 1780. He did not take up the practice of his profession, but devoted himself to literature and public interests and to applying scientific methods in agriculture. Upon the formation of political parties he allied himself with Jefferson and the Republicans against the Federalists. He served several terms in the State Legislature, and was a member of the United States Senate from 1801 to 1807. In 1798, when our diplomatic relations with France were broken off and war seemed inevitable, he conceived the idea of visiting France and attempting in his own private capacity to avert the threatened conflict. Accordingly, taking with him letters from Jefferson and Governor McKean, he went to Paris, where he was well received by Talleyrand and other influential Frenchmen, and succeeded in inducing the French Government to release American prisoners and annul the embargo on American shipping. But though he thus prepared the way for negotiations resulting in the reëstablishment of peaceful relations, his action was looked upon as unwarrantable meddling by our Government; the President and Cabinet refused to have any dealings with him, and he received what was in effect a severe rebuke from Washington, then commander-in-chief. To prevent such action in the future, Congress shortly afterwards passed a law, called the 'Logan Act,' which made it a misdemeanor for a person not properly accredited by the Government to hold intercourse with a foreign Government in order to influence its relations with the United States. In 1810 Logan undertook, this time with the approbation of President Madison, a peace mission to England, but without success. He published *Experiments on Gypsum* and *Rotation of Crops* (1797).

LOGAN, James (1674-1751). An American colonial statesman and author. He was born at Lurgan, County Armagh, Ireland, and in 1699 came to America as the secretary of William Penn. He entered the political life of the Pennsylvania Colony, and rose high in its service, holding, among various offices, those of Provincial Secretary, Chief Justice, and president of the Council; then for two years (1736-38), by virtue of his office, he was acting Governor. In the field of science and literature his contributions were considerable. He wrote both in Latin and English, and left translations of Greek and Latin authors. He was one of the founders of the University of Pennsylvania, and bequeathed to the city of Philadelphia a library of more than two thousand volumes, which have been kept separate under the title of the Loganian Library. Among his works may be noted *Experimenta de Plantarum Generatione* and a translation of Cicero's *De Senectute*, printed by Benjamin Franklin and containing notes and a preface by him.

LOGAN, John (c.1725-80). A famous Indian chief, the son of Shikellamy, a Cayuga chief noted for his friendship with the whites. His real (Indian) name was Tagahjuté, but he was generally known by his English name, Logan, given to him in honor of James Logan, William Penn's secretary and a steadfast friend of the natives. For some time prior to his removal to the banks of the Ohio, about 1770, he lived near Reedsville, Pa., hunting and trading with the settlers, and soon became well known on the Pennsylvania and Virginia frontier as a brave chief, always friendly to the whites. He also became exceedingly popular among the Indians, and about this time was chosen by the Mingoes as their chief. About this time, too, he became much addicted to intemperance. In April, 1774, several whites, headed by a man named Greathouse, the keeper of a whisky shop, murdered nearly the whole of Logan's family in cold blood at Yellow Creek. Logan, frenzied by this blow, incited the already restive Indians forthwith to attack the whites, and in the brief war which ensued (see Dunmore's War) was himself conspicuous for ferocity and cruelty, taking with his own hands as many as thirty scalps. He disdained to sue for peace along with the other chiefs, after the battle of Point Pleasant (q.v.), and instead sent to Lord Dunmore, by a trader named John Gibson, a message which is regarded as one of the finest examples of Indian eloquence, though its authenticity has been called into question. Its charge against Captain Cresap is certainly false, and it undoubtedly owes much to subsequent changes and embellishments. Jefferson in his *Notes on Virginia* quoted it (with modifications), and first directed general attention to it. After Lord Dunmore's War Logan became more and more intemperate. Finally (1780), while in a drunken frenzy, he clubbed his wife, fled, attacked a band of Indians, and was killed by his nephew in self-defense. Consult Brantz-Mayer, *Tagahjuté, or Logan the Indian, and Captain Michael Cresap* (New York, 1867).

LOGAN, John (1748-88). A Scotch divine and poet, born in Midlothian. He entered Edinburgh University in 1762, was licensed as a preacher by the Presbytery of Haddington in 1770, and became minister of Leith in 1773. In 1779-80 and 1780-81 he delivered a series of historical lectures which were published in 1881 under the title *Elements of the Philosophy of History*. The same year he published a volume of verse, and in 1782 a lecture entitled *An Essay on the Manners and Governments of Asia.* This was followed in 1783 by the tragedy *Runnamede,* which was performed at the Edinburgh Theatre. Logan's connection with the stage through this tragedy and a habit he had developed of using stimulants aroused opposition among his parishioners, so in 1786, though one of the most popular preachers of his day, he resigned and went to London, where he devoted himself to literature. It has been claimed that his *Ode to the Cuckoo,* which Edmund Burke characterized as the most beautiful lyric in the English language, was stolen from the papers of Michael Bruce, a deceased friend, whose literary executor he was. But Small's investigations seem to have proved this contention groundless. Consult: *British and Foreign Evangelical Review* (1879), and Chambers's *Eminent Scotsmen* (Glasgow, 4 vols., 1847).

LOGAN, John Alexander (1826-86). An American soldier and political leader, born in Jackson County, Ill., February 9, 1826. He attended Shiloh College for a time and received a limited education. At the outbreak of the war with Mexico he enlisted as a private, and became quartermaster of his regiment, with the rank of first lieutenant. In 1852 he graduated at the Louisville University, and was afterwards admitted to the bar. He was a member of the Illinois Legislature in 1852-53 and in 1856-57, was prosecuting attorney from 1853 to 1857, and was elected to Congress in 1858 as a Douglas Democrat. He was reëlected in 1860, but resigned his seat in 1861 to enter the army. He was made colonel of the Thirty-first Illinois Volunteers, and led the regiment at Belmont, Fort Henry, and Fort Donelson; was wounded in the latter engagement, and in March, 1862, was appointed brigadier-general of volunteers, and a few months later major-general. In the Vicksburg campaign he was in command of a division of the Seventeenth Corps, and distinguished himself at Port Gibson and Raymond, Jackson, Champion Hill, and in the siege of Vicksburg. His command was the first to enter the town, of which he was appointed military governor. In 1863 he was put in command of the Fifteenth Corps, which he led until the death of McPherson, when he took command for a time of the Army of the Tennessee. On being relieved by Gen. O. O. Howard, he returned to the command of his corps, which he led until the fall of Atlanta, when he obtained leave of absence to take part in the political campaign for the reëlection of Abraham Lincoln as President. He afterwards rejoined his corps, leading it in the march through the Carolinas, and ultimately succeeded General Howard in command of the Army of the Tennessee.

He was subsequently elected to Congress for two successive terms as a Republican, and was one of the managers of the impeachment of President Andrew Johnson. In 1871 he was elected to the United States Senate. Soon after his admission to the Senate he distinguished himself by a speech on reconstruction. At the expiration of his term, in 1877, he settled in Chicago and began to practice law, but after a short interval of retirement was reëlected to the Senate. During his career in Congress he made a number of notable speeches, characterized by force and brilliancy. In 1880 he spoke for four consecutive days upon the Fitz-John Porter bill, opposing the restoration of Porter to the army. He was a candidate for the Presidential nomination at the Republican National Convention at Chicago in 1884, and after the ballot was announced which gave that nomination to James G. Blaine, he was nominated by acclamation as the candidate for Vice-President. Soon after the defeat of the Republican ticket he was once more elected by the Republicans of Illinois as United States Senator. He died at Washington, December 26, 1886. James G. Blaine said of him that no other man in the history of the country had combined the elements of successful military and legislative leadership in such an eminent degree. Major-General Logan wrote a volume on the Civil War, entitled *The Great Conspiracy* (1886), and *The Volunteer Soldier of America* (1888). Consult Dawson, *The Life and Services of John A. Logan* (Chicago, 1887).

LOGAN, Mount. The second highest peak of North America. It is situated in the southwestern corner of Yukon Territory, Canada, close to the Alaskan boundary (Map: Northwest Territories, A 2). Its height is 19,500 feet. It was considered the highest peak of the continent until 1898, when the United States Geological Survey found it to be exceeded by Mount McKinley. See McKinley, Mount.

LOGAN, Olive (1839—). An American actress, daughter of Cornelius Ambrosius Logan (q.v.). She was born in Elmira, N. Y., and after having been educated in Paris and London with a view to the stage, became an actress and subsequently a journalist and lecturer. In 1864 she appeared at Wallack's Theatre in New York City in her own play of *Eveleen*. She corresponded for many periodicals, and wrote besides plays (including further a metrical rendering of Coppée's *Le Passant* and a dramatization of Wilkie Collins's *Armadale*), several books on theatrical matters, such as *Before the Footlights and Behind the Scenes* (1870).

LOGAN, Stephen Trigg (1800-80). An American jurist, born in Franklin County, Ky. He studied law, and for a time practiced in his native State, but in 1832 emigrated to Illinois, and opened a law office at Springfield. In 1835 he was made Circuit Judge, and in 1842, 1844, and 1846 was elected to the Legislature. From 1841 to 1844 he was a law partner of Abraham Lincoln. In 1847 he assisted in framing a new State Constitution, and in 1854 was a fourth time elected to the Legislature. He became a Republican upon the formation of that party, and in 1860 was a delegate to the Republican National Convention, which nominated Lincoln. In the following year he went to the Peace Congress at Washington, and then withdrew from public life. Logan was a lawyer of unusual ability, and during his prime was regarded by many as the first member of the bar in the State of Illinois.

LOGAN, Sir William Edmond (1798-1875). An English geologist, born in Montreal, Canada, and educated at the Edinburgh High School and University. While studying the structure of the coal-fields of South Wales he discovered the 'stigmaria-clay' by which he refuted the drift theory of the origin of coal. From 1842 to 1869 Dr. Logan directed the geological survey of Canada, where he brought to notice the supposed fossils of the Laurentian rocks called *Eozoön Canadense.* His investigations of the crystalline rocks of Canada were of far-reaching importance. In 1855 he had charge of the representation of Canadian mineral productions at the Paris Exposition, and in 1856 he was knighted. His chief publication was *Geology of Canada* (1863, with Thomas Sterry Hunt). Consult his *Life* by Harrington (Montreal, 1883).

LO'GANIA'CEÆ (Neo-Lat., from Logania, named in honor of James Logan), The Logania Family. A natural order of dicotyledonous plants, consisting of trees, low and climbing shrubs, and herbs, with opposite, entire, usually stipulate leaves. The calyx is 4-5 partite; the corolla hypogynous, regular or irregular 4-5 or 10-cleft; the stamens adherent to the corolla; the ovary generally 2-celled; the style solitary; the fruit a capsule, a drupe, or a berry. A few species of this order occur in Australia and in the temperate parts of North America; the rest are all tropical or subtropical. There are about 350 known species. The plants of this order are characterized by a bitter principle which is often extremely poisonous. They include the genus Strychnos, of which nux vomica (qq.v.) is one of the products, and another is the woorali or curari (q.v.) poison. The principal representative of the order in the United States is the pinkroot (*Spigelia Marilandica*), which is believed to have medicinal properties.

LO'GANSPORT. A city and the county-seat of Cass County, Ind., 72 miles north by west of Indianapolis; at the confluence of the Wabash and Eel rivers, and on the Pittsburg, Cincinnati, Chicago and Saint Louis, the Vandalia Line, the Wabash, and other railroads (Map: Indiana, C 2). It has a fine county court-house of stone, a public library, and the Northern Indiana Hospital for the Insane, on the south side of the Wabash, comprising a cluster of buildings with a farm of over 300 acres. There are several bridges within the municipal limits across the Wabash and Eel rivers. The city is an important railroad centre, with shops of the Pittsburg, Cincinnati, Chicago and Saint Louis and the Vandalia Line; controls a large trade in lumber and in the produce of the surrounding agricultural country; and manufactures automobiles, car-trucks, lumber, carriages, hubs and spokes, flour, furnaces, baskets, lime, brooms, water-wheels, and foundry products. Abundant water-power and a supply of natural gas are valuable industrial advantages. Logansport, first incorporated in 1838, is governed by a mayor, chosen every four years, and a council, which elects the school board and all officers in other municipal departments, excepting the police commissioners, who are appointed by the State Governor under a metropolitan law. The water-works and electric-light plant are owned and operated by the municipality. Population, in 1890, 13,328; in 1900, 16,204.

LOGAŒDIC VERSE (from Gk. λόγος, *logos*, speech, account, ratio + ἀοιδή, *aoidē*, song; so called because the verse resembles prose). In Greek and Latin prosody, a rhythm in three-eighths time, based on the trochee (—⏑), but admitting the substitution of other feet with great freedom. The most common substitutions are the cyclic dactyl (—⏑ ⏑,—⏑⏑), which can usually be employed but once in the same verse; the irrational trochee (—>); the triseme (⌞—); the tribrach (⏑ ⏑ ⏑); and occasionally in the first foot an iambus (⏑—). Anacrusis, an unaccented initial syllable, is employed in certain forms.

The principal logaœdic forms are the following:

I. DIPODY.

1. *Adonic:*

| —⏑⏑ | —⏑
| πότνια | θῦμον
| terruit | urbem

II. TRIPODIES.

Pherecratics. These are called *First* or *Second Pherecratic*, according to the foot in which the cyclic dactyl is used.

2. (a) *First Pherecratic* or *Aristophanic:*

—⏑⏑ | — ⏑ | —>
Κασταλί | ας τε | νᾶμα
Lydia | dic per | omnes
or —⏑ ⏑ | — ⏑ | ⌞ | ⏒ ∧

(b) *First Pherecratic catalectic*, not found in Latin:

ἡ πόλις—ἡ φί | λων∧

3. (a) *Second Pherecratic:*

—> | —⏑ ⏑ | —>
ἁ πάν | δυρτος ἁ | ηδών
grato | Pyrrha sub | antro
or —> | —⏑ | ⏑ | ⏒ ⌞

(b) *Second Pherecratic catalectic*, not found in Latin:

—> | — ⏑⏑ | —
ἐχθίσ | των ἀνέ | μων∧

Besides the forms given above we also find in the Greek tragedians verses in which the first foot is an iambus or trochee. Also such verses as

—⏑ ⏑ | —⏑ ⏑ | —∧, ⏑ ⋮ —⏑ ⏑ | —⏑ ⏑ | —∧,
⏑ ⋮ ⌞ | —⏑ ⏑ | —∧, ⏑ ⋮ ⏑ ⏑ ⏑ | —> | ∧, etc.

III. TETRAPODIES.

Glyconics. These also are named *First*, *Second*, or *Third*, according to the position of the dactyl.

4. *First Glyconic*, not found in Latin:

ἐκ ποτα | μοῦ παν | ἔρχο | μαι∧

5. *Second Glyconic:*

— 7 | —⏑ ⏑ | —⏑ | —∧
πόντου | χειμερί | ῳ νό | τῳ∧
emi | rabitur | inso | lens

6. *Third Glyconic*, not found in Latin:

φῶτα | βάντα | πανσαγί | ᾳ∧

A great variety of these forms is found in Greek poetry, especially in Euripides; and in Æolic verse the First Glyconic is frequent with anacrusis, ⪖ ⋮ —⏑ ⏑ | —⏑ | —⏑ | —⏑. This is known as the *Praxillean* measure.

7. *Enneasyllabic Alcaic:*

⏑ —⏑ —> —⏑ —⏑
τὸ ⋮ δ' ἔνθεν | ἄμμες | δ' ἀν τὸ | μέσσον
sil ⋮ væ la | boran | tes ge | luque

8. *Lesser (decasyllabic) Alcaic:*

—⏑⏑ | —⏑⏑ | —⏑ | —⪖
οἶνον ἐν | εικα μέ | νοις με | θύσθην
virgini | bus pue | risque | canto

IV. PENTAPODIES.

9. *Lesser Sapphic:*

—⏑ — 7 —⏑ ⏑ —⏑ —>
ποικι | λόθρον' | ἀθάνατ' | 'Αφρο | διτα
inte | ger vi | tæ scele | risque | purus

Three *Lesser Sapphics* and an *Adonic* (1) form the Sapphic strophe.

10. *Greater (hendecasyllabic) Alcaic:*

7 —⏑ —7 —⏑ ⏑ —⏑ —∧
οὐ ⋮ χρὴ κά | κοισι | θῦμον ἐ | πιτρέ | πην
o ⋮ di pro | fanum | volgus et | arce | o

Two *Greater Alcaics*, an *Enneasyllabic Alcaic*, and a *Lesser Alcaic* form the Alcaic strophe.

11. *Dodecasyllabic Alcaic*, not found in Latin:

⏑— ⏑ | — 7 || —⏑ ⏑ | —⏑ | —>
ἰ ⋮ όπλοκ' | ἀγνά, || μελλιχό | μειδε | Σάπφοι

12. *Phalæcean (hendecasyllabic):*

—> | —⏑ ⏑ | — || ⏑ | —⏑ | —>
χαῖρ' ὦ | χρυσο κε | ρως, || βα | βάκτα | κηλων
de di | e faci | lis || me | i so | dales

13. *Pindaric*, not used in Latin:

⏑ ⋮ ⌞ | —⏑ | — ⏑⏑ | — ⏑ | —>
ὀ ⋮ μουσ | ανέ | τας με κα | λετ χο | ρεῦσαι

V. COMPOSITE LOGAŒDIC VERSES.

14. *Lesser Asclepiadean* (*Second* and *First Pherecratic* catalectic):

—> | — ⏑⏑ | ⌞ || —⏑ ⏑ | —⏑ | —>
λάβαν | τῶ ξίφε | ος || χρυσοδέ | ταν ἔ | χων
Mæce | nas ata | vis || edite | regi | bus

15. *Greater Asclepiadic* (the above with a *Logaœdic Dipody* inserted):

—⏑ | — ⏑⏑ | ⌞ || — ⏑⏑ | ⌞ || —⏑⏑
μηδὲν | ἄλλο φυ | τεύ || σῃς πρότε | ρον || δένδριον
nullam | Vare sa | cra || vite pri | us || severis

—⏑ | —∧
ἀμπέ | λω∧
arbo | rem

16. *Greater Sapphic* (*Third Glyconic* and *First Pherecratic*):

—⏑ | —> | — || ⏑⏑ | ⌞ || — ⏑⏑ | —⏑
te de | os o | ro || Sybar | in || cur prope | res a

—>
mando

This seems to be a modification of the verse used by Sappho:

— ⏑ | ⏑⏑— | — || ⏑⏑ | ⌊— || ——⏑⏑ | — ⏑
δεῦτέ | νυν ἆ | βραι || Χαρι | τες || καλλικο- | μοι τε
— 7
Μοῖσαι

17. *Priapean* (a *Glyconic* and a *Pherecratic*):

— > | ——⏑⏑ | — ⏑ | ⌊— || — ⏑> | — ⏑⏑
ψάλλω | πηκτιδα | τῇ φίλ | λῃ || κωμά | ξων παῖδ'
O Co | lonia | quæ cu | pis || ponte | ludere
⌊— | —∧
ἁ | βρῃ
lon | go

In English these metres are rarely found except in imitations of classic lyric measures. See VERSIFICATION.

LOGARITHMIC CURVE (from Gk. λόγος, *logos*, ratio, proportion, word + ἀριθμός, *arithmos*, number). A curve of a single branch, having for its equation $y = \log x : \log a$, or $x = a^y$. In particular, if $a = e$, then $y = \log x$, the ordinate being the logarithm of the abscissa, and the curve representing the Naperian or hyperbolic logarithm. The curve $y = e^x$ is sometimes called the exponential curve, and is evidently the same as the logarithmic except as to its orientation, the two being symmetric with respect to the bisector of the angle XOY. The logarithmic curve was first studied by Gregory in his *Geometriæ Pars Universalis* (1668), and was considered under the names '*logarithmica*' and '*logistica*' by Huygens in his *De Causa Gravitatis* (1690).

LOGARITHMIC SERIES. See SERIES.

LOGARITHMIC SPIRAL, or LOGISTIC SPIRAL. A spiral having for its polar equation $r = ae^{m\theta}$. Since it possesses the property that $\tan V = r : r' = 1 : m =$ a constant, it cuts the radius vector under a constant angle, and is therefore also called the equiangular spiral. It was first brought to the attention of mathematicians by Descartes, in his correspondence beginning in 1637. Its properties were first carefully studied by Jakob Bernoulli in the *Acta Eruditorum* (1691), and have since then been extensively investigated. For bibliography, consult: Brocard, *Notes de bibliographie des courbes géométriques* (Bar-le-Duc, 1897); *Partie complémentaire* (Bar-le-Duc, 1899). See SPIRAL.

LOGARITHMS. A tabular system of numbers, by which multiplication can be performed by addition, division by subtraction, involution by a single multiplication, and evolution by a single division. The logarithm of a number is the exponent of the base which produces the number. If $a^x = b$, x is said to be the logarithm of b to the base a. Any finite positive number greater than 1 may be taken for a base, and the logarithms of all positive numbers with respect to the base may be tabulated. The base 10, however, has been found the most convenient, and the system of 'common logarithms' constructed upon it is universally used for arithmetical computations. The following brief table will serve for purposes of illustration:

$10^{\bar{3}}$	$= 0.001$	10^{0}	$= 1$	$10^{2.8451}$	$= 700$
$10^{\bar{3}.3010}$	$= 0.002$	$10^{0.6990}$	$= 5$	10^{3}	$= 1000$
$10^{\bar{2}}$	$= 0.01$	10^{1}	$= 10$	$10^{3.5441}$	$= 3500$
$10^{\bar{2}.4771}$	$= 0.03$	$10^{1.8451}$	$= 70$	$10^{3.6902}$	$= 4900$
10^{-1}	$= 0.1$	10^{2}	$= 100$	10^{4}	$= 10000$

Here $\bar{3}$ means -3, and $\bar{3}.3010$ means $-3 + 0.3010$. According to the definition, $\bar{3}$ is the logarithm of 0.001, written $\log 0.001 = \bar{3}$; $\log 0.002 = \bar{3}.3010 \ldots \log 10{,}000 = 4$. The integral part of the logarithm is called the *characteristic* and the decimal part the *mantissa*. The characteristics of the logarithms of positive numbers less than 1 are negative, of numbers not less than 10 positive, and of numbers between 1 and 10 they are zero. The mantissas are always taken as positive and are generally incommensurable. A table of mantissas expressed to six decimal places is sufficiently accurate for all ordinary purposes. In the common system, it is unnecessary to tabulate the characteristic, since its value is always one less than the number of places to the left of the decimal point. For example, $\log 659.34 = 2.819109$. Another advantage of the common system is that the mantissas of the logarithms of numbers having the same sequence of figures are equal. For example, $\log 659.34 = 2.819109$ and $\log 65934 = 4.819109$. These two properties belong to the common system only, and to them it owes its superiority over others for the purposes of numerical calculations.

The logarithm being an exponent, it must obey the laws of exponents, and from these are derived the fundamental principles of logarithmic calculation: (1) The logarithm of a product is equal to the sum of the logarithms of its factors. (2) The logarithm of the quotient of two numbers is equal to the logarithm of the dividend less the logarithm of the divisor. (3) The logarithm of a number affected by an exponent is equal to the exponent times the logarithm of the number. E.g. to multiply 50 by 70, $\log (70.50) = \log 70 + \log 5 + \log 10 = 1.8451 + 0.6990 + 1 = 3.5441$ from the above table. But the number corresponding to the log 3.5441, called the antilogarithm is 3500, $\therefore 70 . 50 = 3500$. Also, to extract the square root of 4900, $\log \sqrt{4900}$ or $\log 4900^{\frac{1}{2}} = \frac{1}{2} \log 4900 = \frac{1}{2} \,.\, 3.6902 = 1.8451$ from the table. But the antilog 1.8451 is 70, $\therefore \sqrt{4900} = 70$. In finding the logarithm of a quotient, especially when the divisor contains several factors, it is easier to add the complement logarithm or cologarithm of the divisor than to subtract its logarithm. The cologarithm of a number is defined as the logarithm of its reciprocal. The $\text{colog } n = \log \frac{1}{n} = -\log n$, which justifies its use as explained.

John Napier (1614), a Scotchman, is usually regarded as the inventor of logarithms, although Bürgi (1552-1632) had probably as early as 1607 computed a table of antilogarithms, but he did not fully understand the importance of the invention, and failed to make it public until 1620, when Napier's logarithms were known throughout Europe. Bürgi's *Arithmetische und Geometrische Progress-Tabulen* was published in 1620 in Prague, and contains logarithms of ordinary numbers, while Napier's *Mirifici Logarithmorum Canonis Descriptio* contains logarithms of trigonometric functions. (See TRIGONOMETRY.) Tables of the numerical values of the trigonometric functions had attained a high degree of accuracy at this time, but their usefulness depended upon abridged methods of calculation, and the search after such methods led to the discovery of logarithms. Napier observed that if in a circle with the radii OA_0, OA_1 ($r = 1$) at right angles, the sine S_0S_1 parallel to OA_1 moves from O to A_0 at intervals forming an arithmetic progression, its value decreases in geometric progression. The segment OS_0 Napier originally called *numerus artificialis*, and later logarithmus (ratio number). The first computers of logarithms did not understand the connection between logarithms and exponents, but modern investigations show that 2.7184593 is the base of Bürgi's logarithms, and that $\frac{1}{2.718281828}$ is the base of Napier's. Speidell (1619, 1624), in adapting Naperian logarithms to positive integers, employed as a base 2.718281828, known since the time of Euler as *e*. This system was called by Halley the Naperian system, and this name has been retained, so that to-day 'Naperian logarithms' mean logarithms to the base *e*. Such logarithms are called *natural* logarithms, and the relation between Naperian logarithms of a sine S and its natural logarithm is expressed by the equation Nap. log $S = 10^7$ nat. log $\frac{10^7}{S}$, 10^7 being taken as the sine of 90° and its logarithm zero. According to the integral calculus, the equation $\int \frac{dx}{x} = \log x + k$ may serve as a definition for the logarithm of a number, and from it is derived a relation which gives to the natural logarithm the name *hyperbolic* logarithm. The equation of a rectangular hyperbola (q.v.) referred to its asymptotes is $xy = c$, hence $y = \frac{c}{x}$, and $ydx = \frac{cdx}{x}$, an element of area of base dx and altitude y between the curve and the x-axis; the area between the curve, the x-axis, and two ordinates at x_1, x_2, is proportional to $\log \frac{x_2}{x_1}$.

It appears from the definition that logarithms formed from one base must bear a constant ratio to those formed from another base. This ratio is called the *modulus* of the first system. The modulus of the common system is 0.43429448 . . . hence if the hyperbolic logarithm of a number is *l*, its common logarithm is 0.43429448*l*.

The calculation of tables of logarithms may be effected in many ways. Henry Briggs (1624), who suggested the common system with base 10, calculated to fourteen decimal places the logarithms of numbers from 1 to 20,000 and from 90,000 to 100,000. From the logarithms of perfect powers of 10, he approximated the intermediate logarithms by continually computing geometric means between two numbers, one greater and the other less than the number required. Thus, to find the log 5 take the geometric mean between 1 and 10, or 3.162, the corresponding arithmetic mean (log 1 being 0, and log 10 being 1) being 0.5; the geometric mean between 3.162 . . . and 10, or 5.623, corresponds to the arithmetic mean between 0.5 and 1, or 0.75, the geometric mean between 3.162 and 5.623, or 4.216, has its logarithm = ½ (0.75 + 0.5) or 0.625. This operation is continued until the result is obtained to the necessary degree of accuracy. More recent methods, however, are based upon the logarithmic series. If 1 be put for *u* in the formula,

$$\log_e (u+1) = \log_e u + 2 \left[\frac{1}{2u+1} + \frac{1}{8(2u+1)^3} + \frac{1}{5(2u+1)^5} + \dots\right],$$

the Naperian logarithm of 2 is at once obtained to any degree of accuracy required; if 2 be put for u, the Naperian logarithm of 3 can be calculated, etc., and the common logarithms may be obtained by applying the modulus.

Vlacq (1628) supplied the logarithms for the numbers omitted by Briggs. Gellibrand and Vlacq published tables for the logarithms of the trigonometric functions for every minute of the quadrant.

For a full account of the construction of the early tables, consult the introduction to Hutton's *Mathematical Tables and Mathematical Tracts* (London, 1812). Gauss introduced addition and subtraction logarithms and computed tables which have been largely drawn upon by subsequent writers. Vega's *Thesaurus Logarithmorum Completus* (Leipzig, 1794) had a wide circulation. Contributions to the rapid calculation of logarithms have been made by Koralek (1851), and especially by R. Hoppe in his *Tafeln zur dreissigstelligen logarithmischen Rechnung* (Leipzig, 1876). Other thoroughly reliable tables are Bremiker (Berlin, 1857; 11th ed. 1890); Schrön (Leipzig, 1860, 1886-90; English ed. by De Morgan, London, 1865); Callet (Paris, 1795, and subsequent editions).

LOGAU, lō'gou, FRIEDRICH, Baron (1604-55). A German epigrammatist, born at Brockut, in Silesia, and educated at Brieg and Frankfort. He entered the legal service of the Duchy of Liegnitz as chancery councilor; but is far better known as a poet of the 'first Silesian school,' as the 'Detractor' of the *Fruchtbringende Gesellschaft*, which he joined in 1648, and, under the pseudonym Salomon von Golaw, as author of a collection of epigrams, *Zweyhundert teutscher Reimsprüche* (1638). A second volume is entitled *Deutscher Sinngedichte drei-tausend* (1654). An edition of selections from Logau's epigrams, with linguistic commentary, was published by Lessing and Ramler (Leipzig, 1759); a complete edition by Eitner (Stuttgart, 1872) succeeded his smaller edition with biography (Leipzig, 1870).

LOG-BOOK. The *log-book* is the official record-book of a ship and contains a brief statement of the weather encountered, the speed made, positions of the ship as daily determined by astronomical observations or by dead reckoning, and a short account of all occurrences of importance at sea and in port. The log-book of a man-of-war is a large book of folio size and two pages facing each other are allotted to the records for each day. The left page is about half covered by the 'columns.' These are filled in every hour at sea and in port, and the record consists of the speed of the ship during each hour, the reading of the patent log, the course by compass, the leeway (if any), the height of barometer and thermometer, readings of the hygrometer, temperature of the sea-water, amount of clouds and their character and movement, and the state of the sea. Below the ruled spaces are spaces for recording the amounts of coal and distilled water on hand and received; the latitude, longitude, current, deviation of the compass, etc., as determined by observations of heavenly bodies and by dead reckoning; and other information. The right page is for remarks upon miscellaneous subjects and amplifying the data given in the columns when that is necessary. The remarks are written up at the end of every watch (q.v.), and, in addition to the description of all events passing under the eye of the watch-officer, there is recorded an account of all official transactions, such as enlistments, discharges, court-martials, drills, inspections, boards of survey, signals to other vessels (formerly; now entered in a special signal record-book), accidents of importance, deaths, and other similar matters. The remarks written by each officer are signed by him; a smooth copy, made daily, is also signed, and, when the book is full, forwarded to the Navy Department.

LOG-CABIN HARRISON. A name widely used of William Henry Harrison, said to have originated in a sneering remark in the correspondence of the *Baltimore American* during Harrison's Presidential campaign. The phrase was at once taken up as a party cry by the friends of Harrison, and became extremely popular.

LOG-COCK. The pileated woodpecker. See Woodpecker.

LOGFISH. See Rudder-Fish.

LOGGAN, or LOGAN. See Rocking Stone.

LOGGERHEAD. (1) A large carnivorous sea-turtle (*Thalassochelys caretta*) covered with bony plates, and generically distinguished by having costal shields on each side of the carapace, which finally become ossified. This is the largest of sea-turtles, and may attain a weight of 450 pounds. Its flesh is rank and tough, but the eggs, which the female deposits at night on the sandy shores of southern islands, are much sought for. It ranges from Brazil to Massachusetts, and the Gulf of Mexico has another species or variety (*Kempi*). Gosse says these turtles feed on mollusks, including cuttlefish, and can crush large conchs in their powerful parrot-like jaws. Compare Hawksbill Turtle.

(2) In ornithology, the name of several birds: (a) An American shrike (see Shrike); (b) one or more species of West Indian tyrant flycatchers; (c) a large almost flightless duck of Southern South America (see Steamer-Duck).

LOGGIA, lŏd′jȧ (It., lodge, gallery). An Italian word, somewhat loosely used to designate any roofed structure open on one or more sides to the weather: an arcade, gallery, porch, veranda, or isolated shelter. It is thus applied to such varied buildings as the following prominent examples: (1) The Loggie of the Vatican, the three superposed arcades of the Court of San Damaso, decorated by Raphael and his successors; (2) the open porch in front of the Church of Santa Maria delle Grazie at Arezzo, by Benedetto da Majano; (3) the two-storied arcade or veranda of the Farnesina at Rome by Peruzzi (1517); (4) the Loggia del Bigallo at Florence, a small but ornate fourteenth-century porch or entrance to a fraternity hospital now disused; (5) the great Loggia dei Lanzi at Florence, an isolated vaulted shelter for the lancers or civic guard, built in 1376 probably by Benci di Cione, and now used as a museum of statuary; (6) the Loggia dei Nobili, of approximately the same date and style, and (7) the Loggia del Papa, built in 1462, both at Siena, open vaulted shelters by the side of the street; and (8) the Loggia dei Banchieri at Genoa, built in 1570 to serve as an exchange, an open vaulted hall 60 by 90 feet, now closed in with glass. In American usage the word generally means a room open on one side to the air.

LOGHEM, lō′gĕm, Martinus Gesinus Lambert van (1849—). A Dutch poet and novelist, born at Leyden. After 1877 he lived in Amsterdam, where he was first employed in teaching, then in practicing law, but after 1883 devoted himself exclusively to journalism and literature. A narrative poem, "Eene liefde in het Zuiden" ("Love in the South"), published 1881 under the pseudonym Fiore della Neve, met with uncommon success, and was followed by the lyric cycles *Liana* (1882), *Van een Sultane* (1884), and *Walter* (1892). He proved himself an admirable delineator of character in his novel *Victor* (1888), and the collections of stories *Blond en Blauw* (1888) and *Panaché* (1892).

LOGIC (OF., Fr. *logique*, from Lat. *logica*, *logice*, from Gk. λογική [sc. τέχνη], *logikē* [sc. *technē*], logic, logical [sc. art], from λόγος, *logos*, word, reason). Among the conscious processes treated by psychology (q.v.) are processes of thought. Psychology treats these processes as mental occurrences, and endeavors to ascertain the conditions under which they appear. But they are something more than mere occurrences. They have a peculiar character, which consists in the fact that they purport to be valid, and some of them are subsequently judged to be valid and others invalid. Both valid and invalid thought processes are of equal value to the psychologist, inasmuch as both are actual occurrences and equally demand scientific investigation as to the actual conditions under which they appear. Hence there is room for another science which investigates the differences between valid and invalid thinking and states the conditions to which thinking must conform in order that it may be valid. This science was called *logic* by the Stoics. There is another science which also deals with the validity of our thinking processes, along with the question of the validity of our knowledge in general. This science is called *epistemology*, or the theory of knowledge (q.v.). Many thinkers, especially in recent years, have made no distinction between logic and epistemology, but it is perhaps better to use the word logic in the sense which it had for over two thousand years until the time of Kant, and to apply the term epistemology to the science which deals not with the question, In what way must we think in order that our thought may be valid? but with the more fundamental questions, Is our knowledge valid at all? And if so, What must be the relation of the knowing consciousness to the object known? Kant (q.v.) used logic in a larger sense, which made it include the treatment of this question of the relation of the knowing consciousness to the known object, but he carefully distinguished the two meanings of the word. He thus recognized two kinds of logic, general and transcendental. General logic for Kant is the science which 'deals only with the pure form of thought,' i.e. only with the ways in which thought proceeds when it works correctly. Transcendental logic sets forth 'the origin, the limits, and the objective validity of our pure conceptions'; i.e. it deals with questions of epistemology and of the philosophy of nature. Nowadays it is the fashion, especially in Germany, to call the scientific treatment of such questions epistemological logic (German, *erkenntnisstheoretische Logik*). However, in this article the word will be limited to the science which treats merely of the norms or standards to which our thinking must conform if its results are to be valid.

Taking for granted then that we can have knowledge which is really valid, the question which logic as treated here asks and tries to answer is, According to what standards must the thinking processes work in order that our knowledge, so far as it is gained by thought, may be valid knowledge? In other words, What are the laws of valid thinking? But this question cannot be answered until we have first ascertained the method by which these laws of valid thought may be discovered. There are two theories on this subject, one which maintains that these laws are known *a priori* (q.v.), the other that they are known *a posteriori*. Thus we have a school of rationalistic logicians, and a school of experiential logicians. Among the most pronounced advocates of rationalistic logic stand Wolff (q.v.) and Kant. The latter says of 'general logic' (practically logic as here treated) that "as pure logic, it has no empirical principles. . . . Logic is a demonstrative science, and whatever it contains must be certain entirely *a priori*" (Watson's translation). Others, such as Riehl, maintain that these standards of correct thinking are discovered by experience. We think, and some of our thoughts prove valid, i.e. they lead us to results which are confirmed by all experience; others of our thoughts are not valid, i.e. subsequent experience does not confirm them. Now by examination, so it is claimed, we discover that valid thinking is characterized by certain features; it is all reducible to certain types. These types are the norms or laws of thought. Thus logical laws are on a par with physical laws. Physical laws are statements of the way in which physical bodies act. Logical laws are statements of the way in which correct thinking proceeds. It is only experience, this school asserts, which can reveal to us these laws.

It is impossible in this article to go thoroughly into this question at issue between experiential and rationalistic logicians. All that can be said is that as a matter of fact Aristotle's logic was merely a statement, empirically grounded, of the processes of correct thinking; and all logical advance since Aristotle's day, notably Mill's addition of scientific induction to logic, has been secured by a careful study of the actual processes of what is generally regarded as correct thinking. That is, the science of logic in fact originated and has grown on experiential foundations. There is no *a priori* necessity that we should think logically; otherwise there would be no illogical thinking going on in the world. Neither is there any way of showing that a certain mode of thinking is incorrect except by showing that it actually leads to error. A teacher in logic who wishes to show the fallaciousness of a certain style of reasoning does not appeal to any inner consciousness or *a priori* intuition of his pupil. He shows in the concrete, i.e. by example, that this style of reasoning issues in mistaken conclusions. For example, he shows that it is not correct to say that because all M is P and all M is S, therefore all S is P. How does he prove it? By pointing out that the correctness of the formula would involve the correctness of the argument that all ducks are fowls and all ducks are animals, therefore all animals are fowls. Again, it is not correct to say that because B comes after A, it is the effect of A. Why? Because such a formula would justify the conclusion that "the cock, with lively din, scatters the rear of darkness thin." Experience, however, shows that the cock and his din do not have any perceptible influence in dispelling darkness. Hence the formula is incorrect, and reasoning according to that formula is fallacious. But there are other formulas which express the processes of correct thinking. These formulas are obtained by comparing actual trains of thought which lead to valid conclusions, and by discovering their points of identity.

Now all thinking is judging and all thought is judgment (q.v.). A judgment can always be analyzed into subject and predicate, which in the act of predication are recognized as standing to each other in the relation of object of thought and qualification of that object. The *subject* of a judgment is either a percept or a concept (q.v.). Of the judgments that appear earliest in thought the subjects are without doubt percepts. It is the business of psychology to investigate the origin of percepts. Logic accepts these percepts as given facts any question about whose origin is of no pertinence to its inquiry, inasmuch as it is merely interested in the manner in which these percepts are manipulated by thought; or, in other words, in the various changes which percepts undergo and in the various relations into which they enter, when they become elements in a thought process. Nor are even all these changes undergone by percepts of direct bearing upon the problems of logic. For instance, before any judgment can be made upon a percept, attention (q.v.) is necessary. This state of attention is a very difficult state for the psychologist to deal with; but all the perplexities are of no immediate interest to the logician as logician. He accepts the results produced by attention without bothering himself with questions as to the nature and conditions of attention. Only those changes of percepts which have a direct bearing upon the validity of judgments are treated in logic. These changes are all summed up in the words analysis (q.v.) and generalization, to which may be added comparison (q.v.), inasmuch as neither analysis nor generalization occurs without comparison. Indeed, analysis, comparison, and generalization are really different aspects of the same process. It is at first probably only as one percept is compared with another that any analysis can be made of either of them; and this analysis is possible only as some attribute is discovered to be common to them. And yet this discovery of a common attribute is *ipso facto* an analysis of the percepts. It is usual to add that before a percept can figure in judgment, the common attribute predicated of it must be associated with some word or phrase. That is, many logicians claim that language is a necessary precondition of all judgment. Thus Sigwart says that "it is essential that this" predicate idea "should be taken from those of our ideas which are already known to us and named by words which are understood. It must be an idea which has been already received into consciousness, which is connected with a word enabling us to retain and reproduce it, and which is distinguished from all other ideas. . . I cannot say 'this is blue, this is red,' unless I am already familiar with the ideas blue and red, and can reproduce them with the word. Judgment is possible only when a number of such distinct ideas are retained and easily called into consciousness" (English translation). But Sigwart acknowledges that "some thought is already involved in the process by which these ideas are formed." He excludes the consideration of such thought from logic simply because it "precedes conscious and intentional thought." The difference then between the view advocated by Sigwart and that presented above does not concern the facts, but it concerns the definition and scope of logic. If logic is the science of the conditions of all correct thinking, then judgments whose predicates have no names must be included in its treatment. Otherwise logic must be defined as the science of the conditions of correct intentional thought; and such a definition unwarrantably restricts the meaning of a word that for ages has had a wider denotation. Logic then should treat of the processes by which a percept is recognized as having a qualifying feature even though the thinker has as yet no names at his disposal.

Predicate ideas are, in one sense, always general; in another sense they may be singular. It is at first perhaps only as one percept is compared with another that a feature is recognized in either as qualifying it. A common feature, recognized as qualifying several percepts, is a general idea, and when it is named the term used to designate it is called a general term. But a feature may be peculiar to one object, which at various times presents itself to observation, and may be recognized as qualifying the object each time it appears. In such a case the feature, recognized as characterizing the percept every time it appears is common to the various appearances of the percept, but peculiar to the percept. Whether, therefore, the idea of that feature be considered general or singular depends upon the point of view. Again, any feature which experience presents as a peculiar attribute of an object of perception may appear as a common attribute of various imaginary objects, and in this way be a general idea. In a similar manner, upon the point of view depends the essential or accidental character of an attribute of an object. Every term representing a complex of many qualities or attributes may be used for certain of them as essential to the judgment in which the term is employed, while others are disregarded, and accordingly, for that use, are merely accidents or chance phenomena. The accidental character is thus not inherent in the particular quality, but is determined by the selective nature of thought, and exists only for the particular usage or judgment.

Every general idea is technically a concept, and may be simple or complex; i.e. it may or may not be incapable of analysis. Thus intensity of a color sensation is unanalyzable, while visibility, as qualifying an object, is analyzable into the various attributes of visual sensations. If an object is visible, it is colored or bright, and besides it has an intensity, a duration, and a spatial extension of these sensations. Thus visibility is analyzable; intensity, one of the results of the analysis, as yet has not been analyzed. The results of an analysis of a concept are collectively called its connotation (q.v.), and are severally called its marks; the objects which such a concept qualifies are its denotation (q.v.). The statement of the connotation of a term is called definition (q.v.); a systematic statement of its denotation is called division (q.v.). In general, but not with a mathematical accuracy, denotation and connotation vary inversely; the larger the number of marks in a concept, the fewer will in all probability be the number of real objects which are qualified by the concept. Traditional logic has distinguished between concrete and abstract terms. A term is concrete when it names a total percept or image with its full complement of features; it is abstract if it names only certain of these features. The test of a full complement of features is the ability of these features to function as percept or image without need of supplementation by further features. Thus animal is the name of various percepts or images; the term is therefore concrete. Animality is the name of a certain feature or complex of features characterizing those percepts or images, but the feature or complex of features known as animality is unable to function in consciousness as a percept or image; hence animality is an abstract term. It will be noticed that while animal is a name applied to complete percepts or images, it is thus applicable only because of the attribute of animality which they possess. It names, or technically it *denotes*, the percepts or images; it makes reference to, or technically it *connotes*, the attribute of animality, by virtue of the possession of which the percepts or images have a right to be denoted by the term. Hence, contrary to the traditional opinion, concrete terms are not names of concepts at all; they are names of percepts or images, while at the same time they usually connote concepts. Some concrete terms are said to be non-connotative; i.e. they do not specifically refer to any definite concept which characterizes the objects they name. Proper names, strictly so called, are to all intents and purposes non-connotative. Thus Saint Louis is a name given to a city which is identifiable by various characteristics, not one of which is referred to directly by the name it bears and not one of which is singled out for purposes of identification. Many so-called proper names are not absolutely 'proper' in that they indicate sex or family relationships or nationality or other traits; hence they are to a certain extent connotative. This distinction between connotative and non-connotative terms is really a matter of language, not of logic; for although the *name* Saint Louis does not refer explicitly to any mark possessed by the object it denotes, no *thinker* can employ the term without thinking that object as characterized by some mark. In his thought it is a city, situated on the Mississippi, etc. If not characterized in some way, it is not an object of thought at all. Again, traditional logic divides terms into positive and negative. Corresponding to this distinction in terms, there is in consciousness a two-fold character belonging to every concept. As we have seen, a concept is obtained by analysis of a percept. Analysis always involves distinction of one element of a complex from another, and "distinction is negation" (Spinoza). To distinguish one thing from another is to recognize that it is what the other is not. Concepts thus owe their origin to a primitive negative aspect in the original judgment that breaks a percept up into its constituents. The result of such an analyzing judgment is a complex of differentiated perpetual features or concepts. Now a concept in proportion as emphasis is laid on the difference between it and another concept becomes negative. In order to have any significance at all as part of an object of consciousness, it must indeed have some positively experienced content, either sensational, affectional, or relational. But this content may be practically neglected, and attention may rest almost entirely on its mere difference from other contents of consciousness. A negative term is one whose connotation is an idea negatively conceived. Thus 'inhuman' began as a negative term, because, although in order to have any meaning it must connote some positive feature of experience, still attention was given to its *difference* from another positive feature. A positive term, on the contrary, connotes an idea, conceived with stress on its perceptual or affectional or relational content rather than on its mere difference from other contrasted contents. Thus 'inhuman' as now used generally means cruel, and the perceptual and emotional features connoted by the term are more prominent in thought than those perceptual and emotional features with which this connotation is contrasted. Thus we see that the philological form of a term is no infallible index to its positive or negative quality in logic.

The traditional distinction between absolute and relative terms is related to the distinction we have just discussed. Negative terms are from the very nature of the case relative. But not all positive terms are absolute, for there is positiveness as well as negativity in all relation. Elements related to each other are indeed each what the other is not, but also each is in some respect or feature what it is by virtue of what the other is. A relative term is one which connotes in an object those features that are recognized as belonging to it because some other object is what it is. Thus in the relation of father and son there is negativity; father is not son, and son is not father. But this negativity does not exhaust the relation. There is a positive character possessed by each because the other possesses a positive character. This mutual determination is relatively positive, and any term like 'father' or 'son' which names either of mutually determining objects by connoting some feature given to that object in virtue of such mutual determination is a relative term. And also any abstract term which names such a feature is also relative.

It must be borne in mind that all these distinctions between concepts are distinctions between integral components of judgment. The doctrine of concepts, or, as it is often called, the doctrine of terms, is not an independent branch of logic. It is part of the doctrine of judgment, although tradition has given it an independent treatment, and has included within the doctrine of judgment only a discussion of the quality and quantity of judgments. Quality is a term applied to judgment to express the character it has as affirmative or negative. A judgment is affirmative if it is the recognition of the fact that an object possesses a certain qualifying feature; it is negative if it is the recognition of the fact that an object does not possess a certain qualifying feature. Quantity is a term applied to judgments to express the universality or particularity or singularity of judgment (q.v. for the distinction between singularity, particularity, and universality).

Traditional logic has scarcely so much as recognized the distinction between singularity and universality, much less has it done any justice to the distinction. It took a proposition and divided it into three parts, subject, predicate, and copula. (See Judgment for definition of these terms.) The subject, in this scheme, was the term, either connotative or non-connotative, which denoted the logical subject; but from the logical subject was excluded all consideration of logical quantity. Hence provision had to be made for logical quantity elsewhere, and it was made very mechanically. The subject was regarded as either a single object, or as single mutually independent objects, of which there were a fixed number. Now the question was whether the predicate (see Judgment for definition of the predicate) was affirmed (or denied) of every one of these objects or only of a part of them. In the former case the judgment was considered universal; in the latter, particular. Now, if the subject was only one object, then the predicate was considered as true of the whole subject, and therefore the judgment was in this case regarded as universal. Hence it came about that two so very different judgments as 'Garfield died of an assassin's bullet,' and 'All men are mortal,' were both regarded as universal, because, just as, in the latter, the speaker means *all* men, without exception, so, in the former, he means *all* Garfield without exception. Following this artificial method of identifying singular and universal judgments, logical quantity was regarded as either particular or universal. Now, as there were two possible quantities, particular and universal, and two possible qualities, affirmative and negative, there were, as regards quantity and quality together, four possible kinds of judgments: (1) Universal affirmative (A); (2) universal negative (E); (3) particular affirmative (I); and (4) particular negative (O). The symbols, A, E, I, O, came down to us from Latin logicians, who took the first two vowels of the verb *affirmo*, I affirm, to symbolize the two classes of affirmative judgment, and the two vowels of the verb, *nego*, I deny, to symbolize the two classes of negative judgments, in each case giving precedence to the universal judgment. These symbols form the basis of the nonsense-names given in traditional logic to the moods of the syllogism (q.v.). This same traditional logic divides inference (q.v.) into two kinds—direct, or immediate, and indirect, or mediate. Direct inference is any method of transforming a given single judgment into (apparently) another judgment equally true, or into a judgment known to be false if the given judgment is true, or vice versa. Indirect or mediate inference is a syllogism (q.v.). True induction had originally no place in this scheme, and even now a place can be found for it only by considering induction as a species of syllogism. Direct or immediate inference was divided into inference by opposition (q.v.), conversion (q.v.), obversion (q.v.), and contraposition. See Conversion.

Of recent years attempts have been made to reduce logic to a mathematical discipline. George Boole in his works, *The Mathematical Analysis of Thought* (Cambridge, 1847), and *An Analysis of the Laws of Thought* (London, 1854), promulgated the theory that judgments are equations. Jevons, De Morgan, C. S. Pierce, and E. Schroeder have carried this algebraic treatment of logic out in great detail, and some of them at least claim that there is no really scientific logic except of this algorismic sort. But they have not succeeded in converting many logicians to their way of thinking. The tendency has been to consider logic as an independent science which can only in a very artificial and inadequate way be reduced to algebraic expression.

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LOGIER, lō'zhyā'. Johann Bernhard (1777-1846). A German-English musician and inventor, born at Cassel, Germany. He was of a musical family, and when, at ten years of age, he was taken to England he studied the flute and piano, and subsequently became flutist in the band of an Irish regiment. When it was disbanded he obtained the post of organist at Westport, Ireland. He now invented the 'chiroplast,' an apparatus designed to help beginners to acquire the correct position in playing the piano. It consisted of two wooden bars, parallel to the keyboard, and a pair of open gloves, and by means of this arrangement the wrists were kept elevated, and the fingers were obliged to strike vertically. The chiroplast was later simplified by Kalkbrenner. Both this contrivance and a new system of instruction, by which Logier had several pupils play at once on separate instruments, aroused widespread interest and controversy. Their inventor was quick to take advantage of the notoriety and soon acquired a fortune. In 1821 the Prussian Government invited him to Berlin to teach his system, and he remained there for three years. In 1826 he gave up teaching and settled near Dublin. His compositions, largely for the piano, are unimportant, but his books, *A Complete Introduction to the Keyed Bugle* (an instrument he is said to have invented); *An Explanation and Discussion of the Royal Patent Chiroplast, or Hand-Director for the Piano;* and *The First Companion to the Royal Patent Chiroplast,* are rather interesting. The chiroplast, which Liszt condemned, has been abandoned by musicians, but the 'Logier system' is still somewhat used.

LOGISTICS (Gk. *λογιστική* [sc. *τέχνη*], *logistikē* [sc. *technē*], art of calculation, from *λογιστής*, *logistēs*, calculator, from *λογίζεσθαι*, *logizesthai*, to compute, from *λόγος*, *logos*, speech, word, reason). In military science, the branch which deals with all estimates for supplies of ammunition and transportation. It is one of the most important details of general staff (q.v.) duties in connection with an army in the field, because of its special reference to all matters affecting the arranging and timing of concentration or other marches, and the direction of transportation, etc. It is a leading factor in the art of strategy so far as its provisions are concerned, and with 'tactics' in respect to the actual carrying out of prearranged plans.

LOG'OGRAM (Gk. *λόγος*, *logos*, word + *γράμμα*, *gramma,* letter). A complicated or multiplied form of the anagram (q.v.), where the puzzle-maker, instead of contenting himself with the formation of a single new word or sentence out of the old, by the transposition of the letters, endeavors to discover all the words that may be extracted from the whole or from any portion of the letters, and throws the whole into a series of verses in which synonymous expressions for these words must be used. The puzzle lies in ascertaining what the concealed words are, and, through them, what is the primary word out of which they have all been extracted.

LOGOG'RAPHERS (Gk. *λογογράφος*, *logographos*, historian, from *λόγος*, *logos*, word + *γράφειν*, *graphein*, to write). The name by which the Greek historians previous to Herodotus are designated. The logographers, chiefly Ionian, described in prose the mythological subjects and traditions which had been treated of by the epic poets, supplementing them by material derived from family traditions and those dealing with the founding of cities, so as to form, at least in appearance, a connected history; their works, however, were wholly uncritical. The fragments are published by Mueller, *Fragmenta Historicorum Græcorum*

(1856). The term is, however, often applied to those orators who composed and sold judicial speeches or pleadings.

LOG′OMA′NIA (Neo-Lat., from Gk. λόγος, *logos*, word + μανία, *mania*, madness). A word used vaguely to describe confusion of terms, speech disturbances, and even aphasia occurring in delirious or insane people. Its proper definition is a mania characterized by loquacity; but the word is now obsolete.

LOGONE, lô-gōn′. A tributary State of Bornu, Central Africa, southeast of Lake Chad, between Bornu and Baghirmi (Map: Africa, F 3). The country consists chiefly of a well-wooded plain. The natives, who are allied to the Makaris and Musgu, are estimated at about 250,000.

LOG′OS (Gk. λόγος, *logos*, word). A term used in the fourth Gospel to designate the divine person who became incarnate in Jesus Christ. The idea appears first in the New Testament in the writings of Paul, particularly in the Epistles to the Ephesians, Philippians, and Colossians. The preëxistent Christ is there described as the agent of creation and its goal; as being in the form of God, of which He emptied himself for the work of redemption; and as restored to the glory of the divine throne after the resurrection. John's doctrine is peculiar only in the form of its expression, which he seems to have borrowed from the current phraseology of the times, and thus, at one remove, from Philo. Scarcely more, however, is common to the Evangelist and the philosopher than the term. Philo's fundamental thought is that of dualism. God and the world, spirit and matter, are separated by a deep cleft. The operation of God upon matter is effected through intermediate beings, which are sometimes called logoi, of which the Logos is the chief, and which are scarcely personal. The Logos is the active reason of God, and consequently His power. He is on the one hand the thought of God, and on the other the expression of that thought. He is God himself in His relation to the world, also the archetype of the world, and the unity of the powers operating in it. Hence He can be placed at the side of God and over against the world; and He can also, as comprising the spiritual contents of the world, be set over against God. Hence He is designated, by the use of terms which reappear in the New Testament, as the eldest and first-born of these forces, the eldest angel or archangel, the highest creature, the image, representative, and impression (Heb. i. 3) of God, the high priest, the one 'through whom' (John i. 3) the world was created, or more properly molded. John's doctrine is totally different. There is no dualism, but God is the one infinite and eternal spirit, the creator of the world in the sense of being its ultimate and personal cause. The Logos is also eternal, in some sense distinguished from God and in some sense identical with Him, possessed, therefore, of a quasi-personality, in which He becomes the agent of the creation, and of His own volition shines in the darkness, comes into the world, becomes flesh, and declares the Father. He speaks His message out of divine and eternal knowledge, lays down His life of His own will, returns to the glory which He had with the Father before the world was, and will come again to judge the world. He is ethically one with the Father, but He is more than this, for whoever sees Him sees the Father. And personal faith in Him, which involves the taking of His will as the law of life, is the condition of acceptance with God and of eternal salvation. Once again, in the narrative of the unbelief of Thomas, John employs of Him the word 'God.'

The word Logos may have been chosen by John, as it probably was by Philo, because of suggestions in the Old Testament; 'God said' (Gen. i. 1), the reference to wisdom in Prov. viii. 22, and the later use of *memra* (word) in the Talmud and Midrash. But the origin of the doctrine was in the revelation by Jesus Christ of His own nature and His relation to the Father. Probably on account of its connections with the philosophic terminology of the day, the word Logos was taken up by Justin Martyr, the first apologist, and by him introduced into the course of doctrinal development. While predominantly considered from the first as the eternal ground of the being of Christ, who appeared in this world for our salvation, philosophical interests often laid especial emphasis upon the Logos as the explanation of the world, and thus the Logos-Christology tended to degenerate into a cosmology. This interest was uppermost in Arianism, and was met by Athanasius, who laid fresh emphasis upon the idea of redemption through the Logos become flesh. The deeper theological question as to the relation of the Logos, as the divine in Christ, to the Father was the main topic of all that series of discussions which culminated at Nicæa (325) and led necessarily to the formulation of the doctrine of the Trinity (q.v.). Consult: Lücke, *Commentar über die Schriften des Evangelisten Johannes* (3d ed., Bonn, 1840-56); Dorner, *Development of the Doctrine of the Person of Christ* (Edinburgh, 1862-65); Harnack, *History of Dogma* (London, 1895-1900); Westcott, *Revelation of the Father* (London, 1884).

LOG-PERCH. The largest of the darters (q.v.), reaching a length of 6-8 inches, and readily known by its zebra-like colors. It is to be found throughout the whole interior of the United States, usually in cold, rapid streams, where it is a favorite of boyish anglers, and is always admirable for its swift, graceful movements. Local names in the Southwest are 'rockfish,' 'hogfish,' and 'hogmolly.' Consult Jordan and Copeland, "Johnny Darters," in *American Naturalist*, vol. x. (Salem, 1876). See Plate of PERCHES.

LOG-ROLLING. An American political term used to denote the mutual aid of legislators in carrying out each other's individual schemes. The term applies usually to local legislation, though it may be used with equal force in national politics—as, when there is an understanding between parties that certain bills shall not be opposed simply on party grounds. The term is said to be an allusion to the practice of lumbermen in assisting one another to roll logs from the place at which they are cut to the stream by which they are to be transported.

LOGROÑO, lô-grō′nyô. A city and the capital of the Province of Logroño, on the Ebro, 30 miles southeast of Vittoria (Map: Spain, D 1). It is surrounded by mediæval ramparts; has pleasant promenades and squares; the Church of Santa Maria Palacio, founded according to tradition by Constantine the Great; and a bull-ring accommodating 11,000 persons. As the centre of the fertile vine-growing region of Rioja, it has an important wine trade. It is the Roman *Lucronius* and *Juliobriga*. In 1521 it was unsuccessfully besieged by the French, but was held by them from 1808 to 1813. Population, in 1901, 18,866.

LOGROSCINO, lō'grō-shē'nō, Nicola (1700-63). An Italian dramatic composer. He was born in Naples, and is known to fame for his development of the opera-buffa style, and his method of concluding the close of each act in *ensemble*, which latter innovation has been the custom ever since. His operas include: *Inganno per inganno* (1738); *La violante* (1741); *Il governatore* (1747); *Tanto bene, tanto male; Il vecchio marito; La furba burlata* (1760); and a grand opera, *Giunio Bruto* (1750). He died in Naples.

LOGWOOD (so called because imported in logs). The dark red solid heart-wood of Hæmatoxylon campechianum. The tree belongs to the natural order Leguminosæ, and grows in Mexico and Central America, and in some of the West India islands. It is the only known species of its genus. It grows to a height of 20 to 50 feet; the leaves are pari-pinnate; the racemes many-flowered, and longer than the leaves. The sap-wood is yellowish, and, being worthless, is hewn off with the bark. The heart-wood is heavier than water, close-grained, but rather coarse. It has a slight smell resembling that of violets, a sweetish taste, is astringent, and contains a distinguishing crystalline principle, called *hæmatoxylin* (q.v.). Logwood is imported in billets or logs, usually of very irregular shape; the color is a dark blood-red, becoming almost black after long exposure. The infusion of the wood is also blood-red, which color it yields readily to boiling water; it is changed to light red by acids, and to dark purple by alkalies. While all other dye-woods have been nearly superseded by the artificial colors made from coal-tar, logwood is still used in large quantities, mainly for the production of blacks, but also as a substitute for indigo in the production of blue. It is further used in the manufacture of ink, and it is employed to some extent in medicine for controlling all forms of diarrhœa. In dyeing it is used either in the form of chips or in the form of extracts. Since hæmatoxylin, the ingredient of logwood, to which its value as a dyewood is due, is not in itself a coloring matter, but is capable of yielding one under appropriate treatment, the wood must be subjected to a process of 'curing.' This may be effected by simply moistening the chips and exposing them to the action of the air; usually, however, glue and various chemicals are added for the purpose of hastening the operation, though it is by no means certain that those substances have a beneficial effect. Of the varieties of logwood that occur in commerce, Campeachy logwood is considered the best and commands a considerably higher price than the other varieties. See Dyeing.

LÖHE, lē'e, Johann Konrad Wilhelm (1808-72). A German Lutheran clergyman and theologian, best known for his activity along the lines of practical Christianity, born at Fürth, Bavaria. He was a pupil of Krafft at Erlangen, studied also at Berlin; in 1831 became Vicar of Kirchenlamitz, and won considerable local reputation as a forceful preacher. Under suspicion of mysticism he was removed by the Church authorities from his post; but not long after he was appointed assistant pastor of the Church of Saint Egidia at Nuremberg, where his pulpit eloquence became more widely recognized. In 1837 he received appointment to the pastorate of Neuendettelsau. His philanthropies were notable. Deeply interested in the welfare of German-Americans, he assisted in founding the Missouri synod of the Lutheran Church, and later organized that of Iowa. At Neuendettelsau he established a school for the instruction of missionaries to Germans resident abroad. He also founded the Lutheran Society of Home Missions, and numerous charitable institutions. Best among his collections of sermons are *Sieben Predigten* (1836) and *Sieben Vorträge über die Worte Jesu am Kreuze* (1859). Consult Deinzer, *Wilhelm Löhes Leben* (Nuremberg, 1888).

LOHENGRIN, lō'en-grĕn. The hero of a mediæval German legend. He is the son of Perceval and one of the Knights of the Holy Grail. He is sent by King Arthur to the aid of Elsa, Princess of Brabant, traveling on a boat drawn by a swan. At Mainz he fights with her foe, Telramund, and after his victory marries Elsa, forbidding her to inquire his origin. On his return to Cologne from an expedition against the Saracens, Elsa disobeys his command, the swan returns, and Lohengrin departs. His history is given in a Middle High German poem of the end of the thirteenth century, ascribed to two authors, and exhibiting in its two portions great differences of style and language. The poem elaborates the mention of Lohengrin in Wolfram von Eschenbach's *Parzifal*, in which the hero is called Loherangrin, i.e. Gerin De Loherain (Gerin of Lorraine), and in the fifteenth century was extended and remodeled under the name *Lorengel*. The opera *Lohengrin*, by Richard Wagner, is based on the legend. It was first produced at Weimar, August 28, 1850, under the leadership of Liszt, and marks the beginning of Wagner's triumph in Germany. The text was written in 1845 and the score was finished in 1849. Beck created the rôle of Lohengrin and Frl. Agthe that of Elsa.

LOHENSTEIN, lō'en-stīn, Daniel Kaspar von (1635-83). A German poet, born at Nimptsch, in Silesia, and educated at Breslau and in the universities of Leipzig and Tübingen. On his return to Breslau, after extended travels, he soon became Imperial Councilor and Syndic of the city. He was a member of the second Silesian school, and wrote lyrics under the title *Blumen*, six tragedies, and a long novel, *Grossmütiger Feldherr Arminius*. His works are marked by a sensual tone and by rude and bombastic style. Selections may be found in the thirty-sixth volume of Kürschner, *Deutsche Nationallitteratur*, edited by Bobertag. Consult: Passow, *Lohenstein, seine Trauerspiele und seine Sprache* (Meiningen, 1852); Kerckhoff, *Lohensteins Trauerspiele* (Paderborn, 1877); and Müller, *Beiträge zum Leben und Dichten Daniel Kaspar von Lohensteins* (Breslau, 1882).

LÖHER, lē'ēr, Franz von (1818-92). A German historian. He was born at Paderborn, and after studying at several German universities, traveled in Europe and in 1846-47 visited Canada and the United States. In 1848 he established the *Westfälische Zeitung* at Paderborn. For participation in the political agitations of the time he was imprisoned by the Prussian Government, but afterwards was acquitted. In 1853 he was made professor of the university at Göttingen, and in 1855 in the University of Munich. His works include: *Geschichte der Deutschen in Amerika* (1848); *System des preussischen Landrechts* (1852); *Land und Leute in der alten und neuen Welt* (1854); *Beiträge zur Geschichte und Völkerkunde* (1885); *Kulturgeschichte der Deutschen im Mittelalter* (1891-94); and a few volumes of travel.

LOHMEYER, lō′mī′ẽr, JULIUS (1835-1903). A German writer of juveniles, humoresques, and novels. He was born at Neisse and was educated at Breslau. He early devoted himself to political and then to juvenile writing. His first fame came from his patriotic poems written in 1870 and 1871. His later works include: *Tierstruwelpeter* (1886); *Prinzenreise* (1888); *Kinderlieder und Reime* (1897); *Unter dem Dreizack* (1901); the comedies *Die Freunde aus der Provinz* (1883) and *Der Stammhalter* (1882); the novel *Junges Blut* (2d ed. 1883); and the poetry *Gedichte eines Optimisten* (1885) and *Flottenlieder und Seepoesien* (1900).

LOIGNY, lwä′nyē′. A village of France, in the Department of Eure-et-Loir, noted as the scene of a battle, December 2, 1870, in which the Germans, under the Grand Duke of Mecklenburg, won a signal victory over the left wing of the French Army of the Loire, led by General Chanzy. The German loss amounted to 4000 men, that of the French to 15,000. As a result of the battle the city of Orleans fell into the hands of the Germans.

LOIR, lwär. A river of France rising in the Department of Eure-et-Loir, and flowing in a generally southwest course to its junction with the Sarthe, a tributary of the Maine (Map: France, G 4). Its length is 186 miles and it is navigable by means of locks for over seventy miles.

LOIRE, lwär (Lat. *Liger*). The longest river of France (Map: France, J 4). It rises in the Cévennes in the Department of Ardèche at an altitude of about 4500 feet, and flows in a northern direction partly through a mountainous region to its junction with the Allier (q.v.), near Nevers, where it turns northwest and maintains that direction to Orleans. From there it flows southwest to Tours, and the rest of its course runs in a general westerly direction, emptying into the Atlantic by a wide estuary at Saint-Nazaire. Its total length is over 620 miles, and its basin occupies nearly one-fourth of the area of France. Its chief tributaries are the Allier, Cher, Indre, Vienne, and Thouet, from the left, and the Arroux and the Maine, which is formed by the union of the Sarthe and Mayenne from the right. Only the estuary of the Loire from the sea to Nantes (31 miles) is accessible to sea vessels, but boats ascend as far as Roannes, about 490 miles from the mouth. Navigation is greatly impeded by the insufficient depth of the river at certain periods of the year. The melting of the snow in the mountains and rains cause a rise in the tributaries of the Loire with the result that the main stream swells to many times its usual volume, not infrequently overflowing its banks with disastrous results. To guard against these floods, dikes were constructed along the river as early as the Middle Ages. In the first half of the nineteenth century a canal about 125 miles long was constructed along the river to provide a reservoir for the overflowing water. Canals also connect the Loire with the Saône and the Seine, and there is a canal connecting Nantes with the harbor of Brest.

LOIRE. A southeastern department of France, formerly part of the Province of Lyonnais (Map: France, L 6). Area, 1838 square miles. The basin of the Loire, which flows through this department, is meagrely productive, but the mountains are rich in iron and lead, and the coal-fields are among the richest in France. Loire is also noted for the rearing of silkworms, and for the excellence of its silk manufactures. The weaving of hemp and flax is also largely carried on, and there are important manufactures of hardware, machinery, cutlery, and small arms. The mineral springs of the department are in great repute, especially those of Saint Alban, Sail-sous-Couzan, and Saint Galmier. Capital, Saint Etienne, which replaced Montbrison in 1855. Population, in 1896, 625,336; in 1901, 647,333.

LOIRE, HAUTE. A department of France. See HAUTE-LOIRE.

LOIRE-INFÉRIEURE, äɴ′fā′rē-ẽr′. A maritime department in the west of France, formerly part of Southern Brittany. Area, 2654 square miles (Map: France, E 4). The interior is, on the whole, flat and centrally traversed by the Loire. The soil is fertile, producing wheat, rye, and barley, and yields in some parts rich pasturage. There are also some fine forests. Salt marshes are numerous in the west; and south of the Loire, into which it is drained by the artificial Cheneau, is Grand Lieu, a shallow lake covering 26 square miles. The vineyards yield large quantities of wine. Ship-building is carried on at Nantes. The coast fisheries and general export trade of the department are extensive. Capital, Nantes (q.v.). Population, in 1896, 646,172; in 1901, 664,971.

LOIRET, lwä′rā′. A central department of France, formerly the eastern portion of the Province of Orléanais (Map: France, J 4). Area, 2614 square miles. The country is for the most part an elevated and fruitful plain known as the Plateau of Orléans, abounding in corn and wine. Its chief rivers are the Loire and Loiret. The district along both banks of the Loire, called the *Sologne*, was formerly a barren, sandy tract, but has been greatly improved by the planting of fir-trees. Loiret contains several large forests. Cattle, sheep, and bees receive attention. Mineral springs are numerous. Capital, Orléans (q.v.). Population, in 1896, 371,019; in 1901, 366,660.

LOIR-ET-CHER, lwär′ā-shâr′. A central department of France, formerly part of the old Province of Orléanais. Area, 2452 square miles (Map: France, H 4). The department is almost a uniform plain, centrally divided by the Loire, and broken only by vine-clad hills of trifling elevation. The northern part, watered by the Loire, is more fertile than the south, which is traversed by the Cher. Forests cover one-sixth of the entire surface. The chief products are corn, fruits, hemp, wine, and vegetables. The rearing of sheep and poultry and bee-keeping are profitable industries, and there are manufactures of woolens, cottons, leather, glass, etc. Capital, Blois. Population, in 1896, 278,153; in 1901, 275,538.

LOISELEUR, lwäz′lẽr′, Jean Auguste Jules (1816-1900). A French publicist, historian, and miscellaneous writer, born at Orléans. He was librarian and member of the municipal council of that city, and received the Legion of Honor cross in 1868. His comedy called *Léonore* was produced at the Gymnase Theatre, and he published: *Les résidences royales de la Loire* (1863); *Les crimes et les peines dans l'antiquité et dans les temps modernes* (1863); *Problèmes historiques* (1867); *Le masque de fer devant la critique moderne* (1868); *La doctrine secrète des Templiers* (1871); *Les points obscurs de la vie de Molière* (1877); *Nouvelles controverses sur la Saint-Barthélemy* (1881); and *Trois énigmes historiques* (1882).

LOJA, lō′ʜȧ, or **LOXA.** A city of Ecuador, and capital of the Province of Loja, situated near the southern frontier, 6900 feet above sea-level (Map: Ecuador, B 4). The town lies in a beautiful valley and enjoys a moderate climate, the temperature averaging 64° F. It has a college and a cathedral; its manufactures are woolen goods; and trade is carried on in the products of the surrounding districts. Loja was founded in 1546 by Alonso de Mercadillo. Population, 10,000.

LOJA, or **LOXA.** A town in the Province of Granada, Spain, situated amid romantic surroundings on the slope of a hill near the left bank of the Genil, 30 miles west of Granada, and on the railroad between that city and Malaga (Map: Spain, C 4). The town has a number of notable churches and a modern palace of the Duke of Valencia; on the summit of the hill on which the town is built are the ruins of a Moorish castle. The chief manufactures are paper and woolens. Loja was of great military importance during the wars with the Moors, being the key to Granada. It was captured by the Spaniards in 1486. In 1884 it was almost destroyed by an earthquake. Population, in 1887, 19,120; in 1900, 19,143.

LOKEREN, lō′kẽr-*e*n. A manufacturing town in the Province of East Flanders, Belgium, on the Durme, 19 miles southwest of Antwerp (Map: Belgium, B 3). It is a well-built town, with the fine Church of Saint Lawrence, containing a number of ancient and modern paintings and a famous pulpit by Verhagen. There are extensive manufactures of linen, cotton goods, chemicals, tobacco, etc. In the vicinity are large bleach-fields. Population, 1890, 19,667; in 1900, 21,057.

LOKI, lō′kê (Icel., Ender). A demi-god in the Scandinavian mythology. He did not belong to the race of Æsir (q.v.), but to an older dynasty. Still, we find him from the very first on terms of intimacy with Odin, and received among the Æsir. His appearance is beautiful, and he is possessed of great knowledge and cunning. He often brings the new gods into difficulties, from which, however, he again extricates them. Hence he is to be regarded as the principle of strife and disturbance in the Scandinavian mythology; the 'spirit of evil,' as it were, mingling freely with, yet essentially opposed to, the other inhabitants of the Norse heaven, very much like the Satan of the Book of Job. By his artful malice, he caused the death of Balder (q.v.), and was in consequence visited by the Æsir with most terrible punishments. He is sometimes called Asa-Loki, to distinguish him from *Utgarda-Loki*, a king of the giants, whose kingdom lies on the uttermost bounds of the earth; but these two are occasionally confounded. It is quite natural, considering the character of Loki, that at a later period he should have become identified with the devil of Christianity, who is sometimes called in Norway, to the present day, *Laake*.

LOKMAN, lôk-män′ (Ar. *Lukmān*). A figure in old Arabic folklore, and the supposed author of a number of Arabic fables. According to the old poets he was a wise man of the tribe of Ad, who lived as long as seven eagles or vultures. In the Koran he is mentioned as a monotheistic sage, and some of his sayings are quoted (Sura xxxi. 11-19, from which the Sura is called the 'Lokman Sura'). He is variously held to have been a Yemenite, a black sage of the time of David, or a near descendant of Job and living down to David's time. Derenbourg identifies him with the biblical Balaam, whose name, like that of Lokman, is connected with a root meaning 'to devour;' Sprenger, with the founder of the Elkesaite sect living near the Dead Sea. Toy takes him to represent a clan or family that survived the extinction of the Adites. The fables that go by Lokman's name come from the Syriac versions of the Greek fables of Syntipas and Æsop, and originated probably as late as the thirteenth century. Their language is not that of the classical period. They have had much vogue and have been translated into many of the languages of non-Arabic Mohammedans. The first edition, with a Latin translation by Erpenius, appeared at Leyden (1615); since then they have been used largely in European Arabic reading books. Recent editions are by Bernsten (Göttingen, 1817); Caussin de Perceval (Paris, 1818); Freytag (Bonn, 1823); Roediger (Halle, 1830); Rask (Copenhagen, 1831); Schier (Dresden, 1831, 1839, 1850); Delaporte (Algiers, 1835); Cherbonneau (Paris, 1847, 1883, 1888); and Derenbourg (Berlin, 1850). Translations have been made into Hebrew, French, Spanish, Italian, German, and Danish. Consult: Basset, *Loqman Berbère* (Paris, 1890); Chauvin, *Bibliographie des ouvrages arabes*, vol. iii. (Paris, 1898); Toy, in the *Proceedings of the American Oriental Society*, May, 1887, pp. clxii. sqq. (in the *Journal*, vol. xiii., 1889).

LOLA MONTEZ, lō′lȧ mōn′tȧth. A celebrated adventuress. See Montez, Lola.

LOLLAND, lŏl′l*a*nd. An island of Denmark. See Laaland.

LOL′LARD (from MDutch *Lollaerd*, name of a semi-monastic sect of Brabant, from *lollen*, to sing softly, to hum; connected with Ger. *lullen*, Eng. *lull*, probably onomatopoetic in origin). A name first given to a semi-monastic society which arose in Antwerp and Brabant about 1300, the members of which devoted themselves to the care of the sick and burial of the dead. They are also called Alexians (from their patron, Alexius, q.v.) and Cellites. The name was afterwards given to those who, during the closing years of the fourteenth and a large part of the fifteenth century, were credited with adhering to the religious and economic views advocated by John Wiclif (q.v.) The nucleus of the Lollards was a body known as the 'Poor Priests,' called together by Wiclif to preach a simple gospel in the smaller villages of Central England and to counteract the influence of the begging friars. Oxford was the central point whence they went forth and whither they returned. The Lollards were at one time very numerous, and were to be found among all classes of the population. The examinations of those who were arrested or punished as heretics after Wiclif's death in 1384 indicated their common doctrinal position. With minor differences, they agreed in condemning the use of images in the churches, pilgrimages to the tombs of the saints, the temporal lordship of the clergy, Papal authority in administration, ecclesiastical decorations, the ceremony of the mass, the doctrine of transubstantiation, the waging of war, and the infliction of capital punishment. Lollardism was by no means confined to the southern portion of the British Islands, but penetrated into Scotland, where it received the ancient traditions of the Culdees (q.v.). In the year 1494 Archbishop Blacader caused twenty persons to be summoned before the King (James IV.) and the great council, and indictments were found on substantially the same grounds as in England, with the additions that masses cannot profit the dead and that priests may lawfully marry. Certain of the Lollards, both in England and Scotland, developed economic theories of a socialistic nature, and this had much to do with their persecution and downfall. Consult: Stubbs, *Constitutional History of England*, vol. iii. (5th ed., Oxford, 1895); Creighton, *History of the Papacy*, vol. ii. (London, 1882); and the works mentioned in the article on John Wiclif.

LOLOS, lō′lōz, or Nesus. A people living in large numbers in the northeast of Yun-nan, the west of Sze-chuen, etc., in Southwestern China, probably the aborigines of this portion of the Celestial Empire. They are the 'savages' whom the Chinese found in their conquest of this part of the country, and Yun-nan is still the least Chinese province of all. The Lolos, together with the Miaotse and cognate peoples of China, Farther India, and Tibet, represented an old, pre-Chinese population, which was formerly considered typically Mongolian or 'Turanian,' but this view is now considered inaccurate. Physically they are described as somewhat slenderly built, with brownish rather than yellow skin, and features recalling the Caucasian rather than the Mongolian. Some have compared them to the fairer Gypsy type. Their eyes do not seem to possess the 'Mongolian droop.' Some of the Lolo women present the type in a delicate and rather graceful form. Some ethnologists see in the Lolos what they term a 'sub-Caucasian' strain of blood; others would term them proto-white or pre-Caucasian. The Lolos are said to be good miners and metalsmiths. With them woman has a comparatively high position, and some of the more independent tribes have even had female chiefs. They seem to be of a merry temperament, and have numerous dances and songs. According to some authorities, the language of the Lolos is related to the Thai stock of Farther India. Some of them possess a mode of writing of the hieroglyphic order, while others are said to have adopted a Tibetan form. Consult: Garnier, *Voyage en Indo-Chine* (Paris, 1873); Colquhoun, *Across Chrysé* (London, 1883); Bourne, *Journey in Southwest China* (London, 1888).

LOM′AX, Lindsay Lunsford (1835—). An American soldier. He was born at Newport, R. I., and after graduation from the United States Military Academy was assigned to the Second Cavalry. He resigned from the United States Army to become captain in the Virginia State forces, and served throughout the Civil War, obtaining the rank of major-general in 1864, and discharging creditably several important cavalry assignments. He served in all the battles of the Army of Northern Virginia in the Valley District, and after the fall of Richmond surrendered with Gen. Joseph E. Johnston at Greensboro, N. C.

LOM′BARD. A name formerly employed in England to designate a banker or money-lender. The great bankers of the Middle Ages were Italian merchants who came principally from the cities of Lombardy, and settled in London, Paris, and other large cities of Northern Europe. Lombard Street in London became a great financial centre, and finally the name *Lombard* meant money-lender and usurer. See Pawnbroking.

LOMBARD, lŏm′bȧrt, Johann Wilhelm (1767-1812). A Prussian Minister of State, born in Berlin of a Huguenot family. He was secretary of the Cabinet in 1786, and was sent on an important mission with Count Lusi in 1790. After the death of Frederick William II. Lombard lost power, but in 1800 he was restored to favor, and from that time on was foremost in the defense of the royal policy of friendly neutrality to France. In 1803 he met Napoleon near Brussels. The ill success of his policy increased the natural opposition to it, and most of the blame came to Lombard. Imprisoned by order of the Queen on the charge of treacherous correspondence with France, he was set at liberty by the King and rewarded with the post of secretary of the Academy. Besides a history of the Prussian campaign of 1787 in the Netherlands (1790), Lombard wrote, in defense of his foreign policy, *Matériaux pour servir à l'histoire des années 1805, 1806, 1807* (1808).

LOM′BARD, Lambert (1505[6?]-66). A Flemish painter, erroneously called Suavis, Sustermann, and Sustris. He was born at Liège, studied under Arnold de Beer and Mabuse, and in Rome, whither he accompanied Cardinal Pole in 1538, became the pupil of Andrea del Sarto. The works of Raphael and Titian, and especially of Bandinelli and Mantegna, made a lasting impression upon him, and on his return to Liège he opened a school which was largely attended, and through whose agency his style was further diffused in the Netherlands. Among his pupils were Frans Floris, Hubert Goltzius, Willem Key, and others of equal reputation. His pictures are now very rare and difficult to identify. One of his principal works is the "Martyrdom of Saint Barbara," in Saint Bartholomew's at Liège. Others attributed to him are: a "Descent from the Cross," in the National Gallery, London; "Last Supper" (1531), and "The Scourges of the Almighty," both in the Brussels Museum; a "Madonna" in the Berlin Museum, and "Adoration of the Shepherds" in the Vienna Museum. He was proficient also in architecture, numismatics, archæology, and poetry.

LOMBARD, PETER. See PETER LOMBARD.

LOMBARD ART. The style which was used by the Lombard invaders and colonists of the north of Italy, from the seventh century till it was superseded by the importation of the Pointed style from France in the beginning of the thirteenth century. It is a special national phase of the general style called Romanesque (q.v.), like the Norman (q.v.). It prevailed not merely in Lombardy, but in other parts of Italy partly colonized by the Lombards or influenced by them, especially in southern parts, such as Apulia. The architecture is heavy in proportions and detail, dark and plain in tone, using usually local stone and sometimes brick, contributing more than any other Italian school to the use of vaulting in church interiors. Milan and Pavia were the centre of one branch of the school; Parma, Piacenza, and Modena of a second; Verona of a third; Como of a fourth; while such cities as Bologna, Crema, Cremona, Novara, Brescia, and Bergamo show local variations of the Milanese variety. The style is good in construction and composition, but is deficient in architectural detail and decoration, except in the Apulian branch, which is exceedingly rich. In Apulia the cities of Bari, Bitonto, Biteto, and Altamura contain the most important churches. Sculpture, though exceedingly crude in the Milanese-Paduan school, was fairly good and abundant in the Veronese and Parmese branches, as well as in Apulia, but painting was neither a favorite nor a well-executed form of Lombard art, in comparison with the Tuscan, Roman, and Southern schools of Italian art. The Lombards had no color sense.

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LOMBARDI, lôm-bär′dė. The name of a family of architects and sculptors who emigrated about 1450 from Carona in Lombardy to Venice, where they were engaged in many important works. Three generations of this family, whose real surname was Solaro, are known to have worked in Venice, but their personal history is obscure, and of two of them, MARTINO LOMBARDO, who was the first to emigrate to Venice, and MORO, one of his sons, little is known beyond their names. To Martino are sometimes ascribed the later portions of the Church of San Zaccaria at Venice. The most distinguished of the Lombardi was Martino's son, PIETRO (c.1433-1515), who designed the beautiful Church of Santa Maria dei Miracoli at Venice (1480), and the imposing Palazzo Vendramin-Calergi (1481), one of the noblest of Venetian palaces, and one of the earliest in Italy to be designed with engaged columns in superposed orders. He was architect also of the tomb of Dante at Ravenna (1482); also (in collaboration with others) of the Scuola di San Marco (1485 or 1489), and of the Cathedral of Cividale di Friuli (1502), of the Procurazie Vecchie (1496-1517), and of the wings of the clock-tower on the Piazzo San Marco; besides other buildings in Treviso, Pavia, and Venice. He appears also to have worked on the court façades of the Doge's palace (1498). As a sculptor he executed, wholly or in part, many of the notable monuments in the churches of Venice. His sons ANTONIO and TULLIO assisted him in many of his works, notably in the Scuola di San Marco, the Church of San Salvatore, and the Mocengo tomb in the Church of Saint John and Saint Paul. Tullio was also engaged in the rebuilding of the Cathedral of Cividale, and with his son SANTO (or Sante), in the Scuola di San Rocco, a work in which the name of a certain GIULIO Lombardo also appears (1517-27). Tullio, like Pietro, was a sculptor as well as architect; he assisted Leopardi in the monument to Andrea Vendramin, and in association with Antonio executed sculptures in the Capella del Santo at Padua (1507). The later years of Antonio's life were spent at Ferrara, where he died in 1516. To Santo is attributed the Palazzo Malipiero. Little or nothing is known of the work of MORO Lombardo.

The work of the Lombardi occupies an important place in Venetian art. It is highly decorative, and marked by exuberant fancy combined with delicacy and refinement of detail. Some writers, including Ruskin, use the term Lombardic to designate the works of the Lombardi and their school. GIROLAMO and ALFONSO Lombardo were inferior artists not related to the foregoing. Consult: Burckhardt, *Der Cicerone* (8th ed., Leipzig, 1900); Selvatico, *Sull' architettura e sulla scultura in Venezia* (Venice, 1847); and Temanza, *Vite dei più celebri architetti e scultori veneziani* (Venice, 1762-68).

LOMBARD LEAGUE. An alliance formed in 1167 by the leading cities of Northern Italy against Frederick Barbarossa. See LOMBARDY.

LOMBARDS (OF. *Lombard, Lombart,* Fr. *Lombard,* Lat. *Longobardus, Langobardus,* AS. *Langbearda,* probably Long-beards; less likely, Long-axes). A Germanic people of the age of migrations. About the second century A.D. they seem to have begun to leave their original seats on the Lower Elbe, where the Romans probably first came in contact with them about the beginning of the Christian Era, and to have fought their way southward and eastward till they came into close contact with the Eastern Roman Empire on the Danube. They adopted an Arian form of Christianity, and after having been for some time tributary to the Heruli, rose to independent power shortly after the middle of the sixth century, becoming masters of Pannonia, and one of the most wealthy and powerful nations in that part of the world. Under their King, Alboin (q.v.), they invaded and conquered the north and centre of Italy (568-572). The more complete triumph of the Lombards was promoted by the accession of strength which they received from other tribes following them over the Alps—Bulgarians, Sarmatians, Pannonians, Norici, Alemanni, Suevi, Gepidæ, and Saxons—for the numbers of the Lombards themselves were never very great.

Except where there was immediate need of united action the Lombards were generally divided into little bands, each under a so-called duke, who endeavored to secure an independent principality for himself. The various dukes overran almost all of Italy except a few fortified towns. Alboin was succeeded about 573 by Cleph, whose reign was a period of unbroken anarchy, and who was followed by Authari (584-590), who assumed the title of Flavius, which had been borne by some of the later Roman emperors, and asserted the usual claims of a Roman ruler. The administration of the Lombard Kingdom was soon so superior to that which then prevailed in other parts of Italy that to many the change of master was a positive relief from unjust and severe exactions. While the higher nobility, however, in general retained some portion of their former wealth and greatness, the possessors of small properties became fewer in number, and sank into the class of mere cultivators. The rights of the municipal corporations, although acknowledged, were gradually abridged, partly through the encroachment of the Lombard dukes and partly through those of the higher clergy, till few relics of their ancient self-government remained. These few, however, were the germs from which, at a subsequent period, the liberties of the independent Italian cities were developed.

The conversion of the Arian Lombards to the orthodox faith was brought about by the policy of Gregory the Great and by the zeal of Theudelinda, wife of Authari, and subsequently of his successor, Agilulf (590-615). Theudelinda persuaded Agilulf to restore a portion of their property and dignities to the Catholic clergy, and to have his own son baptized according to the Catholic rites. She also built the magnificent Basilica of Saint John the Baptist at Monza, near Milan, in which in subsequent times was kept the Lombard crown, called the *Iron Crown*. The Lombards were ere long fully united to the Roman Catholic Church. The contests of the dukes prevented the firm consolidation of the Kingdom, or any very considerable extension of its boundaries. The edict of the Lombard King, Rothari (636-652), declaring the laws of the Lombards, promulgated in 643, is memorable. It was revised and extended by subsequent Lombard kings and remained in force for several centuries after the Lombard Kingdom had passed away. The Lombards gradually became assimilated with the former inhabitants of the land, their rude customs began to assume something of refinement, and the Latin language prevailed over the German. Of this original Lombard language little is known, nothing remaining to attest its German character except a few words and names, the very ballads in which the stories of Lombard heroes were recorded having come down to us in Latin versions.

Liutprand (712-744) raised the Lombard Kingdom to its highest prosperity. He quelled with a strong hand the turbulence of the nobles, and sought to extend his dominion over all Italy. King Aistulf (749-756) gave a finishing blow to the Exarchate of Ravenna. (See RAVENNA, EXARCHATE OF.) But the efforts of the popes to increase their temporal power, and the disputes which arose concerning the succession to the Lombard throne, led to the downfall of the Lombard Kingdom within a short time after. The popes allied themselves with the Frankish kings, and Pepin the Short, in gratitude for the Pope's sanction of his act in dethroning the Merovingian King, and making himself absolute ruler, invaded Italy in 754-755, and compelled King Aistulf to refrain from further conquests, and even to give up some of the cities which had already yielded to his arms; these Pepin bestowed upon the Church. New causes of hostility between the Frankish and the Lombard monarchs arose when Charles the Great sent back his wife, the daughter of the Lombard King Desiderius (756-774), to her father, whereupon Desiderius embraced the cause of the children of Carloman, Charles's brother, against the King. In the autumn of 773 Charles invaded Italy; and in May of the following year Pavia was conquered and the Lombard Kingdom was overthrown. In 776 an insurrection of some of the Lombard dukes brought Charles again into Italy, and the dukedoms were broken up into counties, and the Lombard system, as far as possible, was supplanted by that of the Franks. In 803 a treaty between Charles and Nicephorus, the Eastern Emperor, confirmed the right of the former to the Lombard territory, with Rome, the Exarchate, Istria, etc. The independent Lombard duchy of Benevento survived the overthrow of the Lombard Kingdom. Consult Hodgkin, *Italy and Her Invaders*, vols. v.-viii. (Oxford, 1880), where many references to sources and secondary works are given.

LOMBARDY, lŏm′bẽr-dĭ. The historic name of that part of Northern Italy which comprises the modern provinces of Bergamo, Brescia, Como, Cremona, Mantua, Milan, Pavia, and Sondrio. It lies mainly north of the Po, between Piedmont on the west and Venetia on the east, and embraces the valleys of the Ticino, Adda, Oglio, and Mincio rivers. Lombardy is in great part a fertile plain, splendidly irrigated, and yielding bountiful crops of maize, wheat, and rice. The northern part is occupied by the Alps. On the borders of Piedmont is Lago Maggiore and on the Venetian borders is Lago di Garda, while within the Lombard territories are Lakes Como, part of Lugano, and Iseo. Lombardy produces immense quantities of silk, and is noted for its cheese. Wine is extensively produced. Lombardy is industrially the most important section of Italy. The population, in 1901, was 4,282,728. The principal city is Milan. Lombardy has its name from the Lombards, who occupied the region in the second half of the sixth century. (See LOMBARDS.) In 774 Charles the Great, King of the Franks, put an end to the Lombard Kingdom. After the dissolution of the Carolingian Empire and the rise of the new German Roman Empire, Lombardy, with a great part of Italy, was held in a nominal feudal subjection to the emperors, and those of the Saxon and succeeding houses came down at intervals and held diets in the plains of Roncaglia. In the development of industrial cities in Italy which was so remarkable a feature of the centuries from the tenth to the twelfth, Lombardy took a leading place, and a strong spirit of independence arose in the rich and prosperous commonwealths, of which Milan and Pavia were the most notable. A league of the Lombard cities, formed in 1167, was strong enough to oppose the Emperor Frederick Barbarossa (see FREDERICK I.), to defeat him at Legnano (1176), and to wrest from him in the Peace of Constance (1183) numerous chartered privileges. This peace granted such a measure of autonomy to the cities as to make the League, which was officially recognized, virtually a republic, recognizing the nominal suzerainty of the Emperor. Jealousy among the cities of the League prevented their utilizing this opportunity for the creation of a strong federal State. The League soon fell apart. It was revived in 1226 to resist Frederick II. (q.v.), without any especial cause, but this only resulted in prolonged dissension and civil war. In the thirteenth century, well characterized as the Age of Despots, the Lombard cities began to fall under the rule of tyrants. Early in the fourteenth century the House of Visconti became paramount in Milan. The Emperor Henry VII. went down into Italy and was crowned with the iron crown at Milan in 1310. In the warfare of the petty States which characterized the Italy of the Renaissance the Lombard cities and principalities had their full share, and they suffered from the marauding of the Free Companies that were turned loose upon Italy by this irregular strife. In 1395 Milan, with its extensive territory, was erected into a duchy for the Visconti, who in 1447 were succeeded by the House of Sforza. France, under Louis XII. (1498-1515) and Francis I. (1515-47), attempted ineffectually to achieve the conquest of Milan, which was repeatedly won and lost. On the extinction of the Sforza dynasty in 1535, the Emperor Charles V. took possession of the duchy, which was united with the Crown of Spain. In the War of the Spanish Succession (1701-14) Austria wrested the Milanese from Spain, and simultaneously took possession of the Duchy of Mantua, whose dynasty, the House of Gonzaga, had become extinct (1708). Bonaparte in 1796-97 overran Lombardy and erected there the Cisalpine Republic. The country was lost by the French in 1799, but was recovered in the memorable campaign of 1800 and held until 1814. In 1805 Napoleon had himself crowned with the iron crown as King of Italy. The Congress of Vienna (q.v.) made Lombardy, as well as Venetia, an Austrian province, as compensation for Belgium. The two provinces were constituted the Lombardo-Venetian Kingdom (1815). They were given separate administrations, that of Lombardy being centralized at Milan, but one of the Austrian archdukes was made viceroy of both. The repressive Austrian system of unchecked absolutism, maintained by a secret police, reduced Lombardy to the level of a conquered territory. The revolutionary year 1848 brought with it the inevitable revolt against these intolerable conditions, and Charles Albert (q.v.), King of Sardinia, came to the aid of Lombardy. His efforts to secure the liberation of Italy ended in disaster. (See ITALY.) The defeat of Novara (March, 1849) put an end to the hope of liberation for ten years, during which the Austrian yoke again rested heavily upon Lombardy. In 1859 the statesmanship of Cavour effected that combination whose first result was to wrest Lombardy from Austria. The campaign of the allied French and Sardinian armies against Austria was decided by their victories at Magenta and Solferino (June, 1859). By the Treaty of Zurich, concluded in November, 1859, Lombardy passed from Austria to Sardinia, and in 1861 it became part of the new Kingdom of Italy. See ITALY.

LOMBARDY, RENAISSANCE ARCHITECTURE OF. The Renaissance style appears to have been brought into Lombardy about the middle of the fifteenth century by various artists from Florence, Urbino, and other places south of Lombardy, chief among whom were Antonio Averulino, known as Filarete, Donato of Urbino, the great Bramante, Michelozzo and Alberti, of Florence. Filarete was cathedral architect in Milan 1452-54, and there in 1457 laid the first stone of his master work, the Great Hospital (Ospedale Maggiore); and began in 1457 also the cathedral of Bergamo. About the same time Michelozzo of Florence built the Portinari chapel of San Eustorgio at Milan, in the new style. Bramante, between 1472 and 1498, built in Milan a continuation of Filarete's Great Hospital, the transept and sacristy of San Satiro, the lower part of the transept and choir of Santa Maria della Grazie, and its sacristy; near Milan the façade of Abbiata Grasso; at Como the nave of the cathedral of Pavia. Alberti had meanwhile planned, and shortly before his death in 1472 begun, the great Renaissance church of San Andrea at Mantua.

This was the period of the rule of the Sforzas in Milan and Pavia, and of the Gonzagas at Mantua, under whom the arts were liberally encouraged, and at Pavia especially a long list of native Lombard artists were employed on the magnificent façade of the Carthusian church (La Certosa), begun in 1396 as a Gothic church, but left with an unfinished front until 1473, when Borgognone began the present façade. Omadeo, who was employed on this work, built also at Bergamo the beautiful Colleoni chapel of S. Maria Maggiore. A few years later the highly ornate church of S. Maria dei Miracoli at Brescia, by unknown architects, and the Palazzo Comunale in the same city, by Formentone of Vicenza, and others (about 1489), carried the style to the eastern boundary of Lombardy.

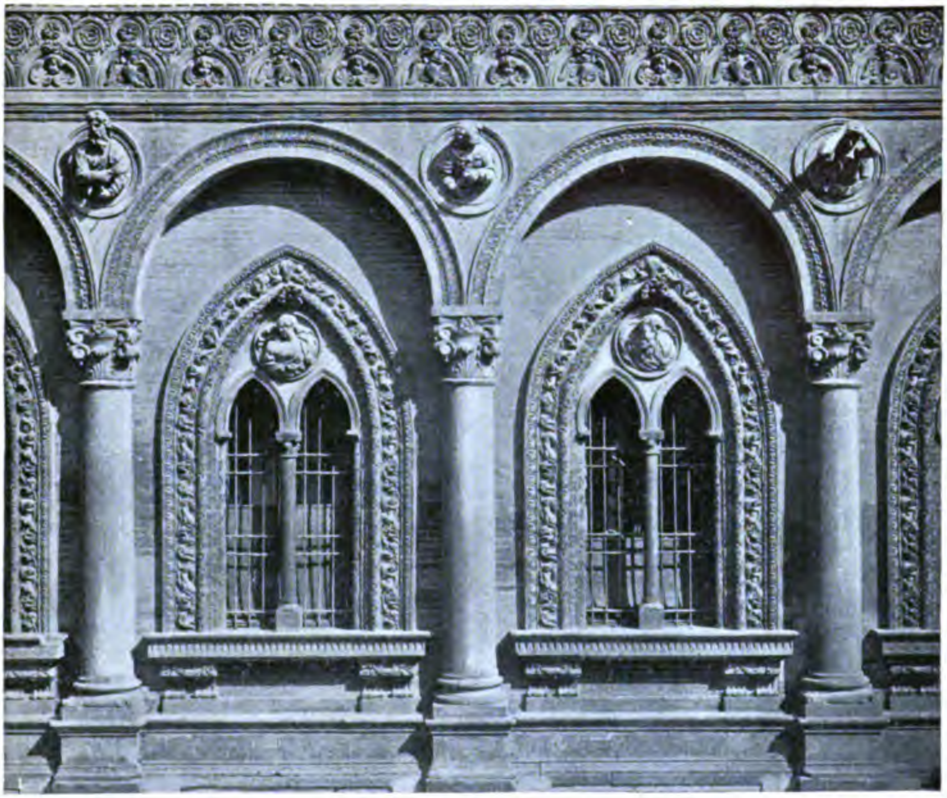
Meanwhile a Lombard family, the Solari, had established the style in Venice, so that the early Renaissance style in that city is sometimes known as the Lombardic or Lombardesque style (see LOMBARDI). Some of the other conspicuous monuments of the early Renaissance in this province are the Besta palace at Teglio, the court of the Stanga palace at Cremona, the cathedrals of Como and Bergamo, the interesting brick and terra cotta façades of San Pietro at Modena, of the church of the Madonna della Campagna, and of the Palazzo dei Tribunali at Piacenza, the Vezzani Pratonieri palace at Reggio, and many others. The Middle or High and the Late Renaissance of the sixteenth century produced fewer works than the earlier period; but among these such master works as the Palazzo del Tè and the Grand Duke's palace at Mantua, with magnificent frescoes and stucco enrichments by Giulio Romano and his school, the Brera palace at Milan, the great church of San Domenico at Bologna, and the cathedral at Brescia, take high rank.

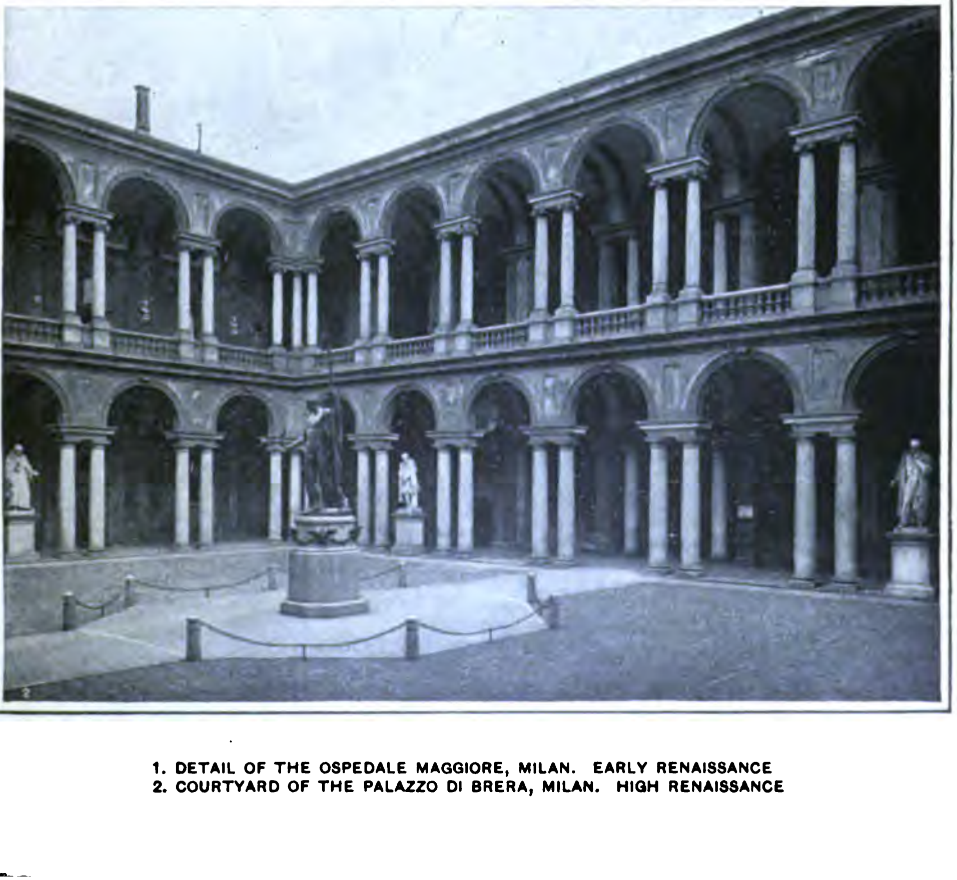
The style of the Lombard works of the early Renaissance is more ornate, less reserved and majestic and large in scale than that of the Tuscan or Roman schools. This may in part be due to the widely prevalent use of brick and terra cotta, for which the abundance of excellent clay in Lombardy furnished every advantage. It was at its best between 1472 and 1500.

Consult: Burckhardt, *Der Cicerone* (Leipzig, 1900); Geymüller, "The School of Bramante," in *Transactions of the Royal Institute of British Architects* (1890-91); and Dohme, "Nord-italienische Central-Bauten," in *Jahrbuch der königlich preussischen Kunstsammlungen* (vol. iii., 1882).

LOMBOK, lŏm-bŏk′. One of the Sunda Islands, Dutch East Indies, situated between the islands of Bali and Sumbawa, in latitude 8° 12′

LOMBARDY—RENAISSANCE ARCHITECTURE





1. DETAIL OF THE OSPEDALE MAGGIORE, MILAN. EARLY RENAISSANCE
2. COURTYARD OF THE PALAZZO DI BRERA, MILAN. HIGH RENAISSANCE

to 9° 1′ S., and longitude 115° 44′ to 116° 40′ E. (Map: Australasia, D 3). Its area is estimated at about 2100 square miles. The island is of volcanic origin and mountainous, rising in its highest peak to an altitude of over 12,000 feet. The coasts are well indented and form several good harbors. The soil in the valleys is fertile, producing good crops of rice, corn, tobacco, sugar, indigo, and coffee. Stock-raising is also well developed, buffaloes, cattle, and horses being exported to a considerable extent. Lombok forms, together with Bali, a residency of the Dutch East Indies. The population of the island was estimated in 1890 at 635,500, composed chiefly of Sassaks (the aborigines), natives of Bali Island, and Malays. The chief town is Mataram, on the western coast, and the chief commercial centre, Ampanan. Since the uprising of 1894 the island has been under the direct control of the Dutch.

LOMBROSO, lôm-brŏ′zô, Cesare (1836—). A noted Italian criminologist, born at Venice. He studied literature, linguistics, and archæology, but changed his plans and became an army surgeon in 1859. In 1862 he was appointed professor of diseases of the mind at Pavia, and later took charge of the insane asylum at Pesaro, eventually becoming professor of medical law and psychiatry at Turin. The appearance of his great book, *The Criminal* (*L'uomo delinquente*), in 1875, marked the beginning of the science of criminal anthropology, and Lombroso became the head of the Italian school. It is the theory of Lombroso that there is a definite criminal type, the born criminal, distinguished from other men by physical stigmata which can be easily determined, differentiated from the normal anatomically as well as psychologically. Chief among these stigmata are excessive asymmetry of the skull, small cranial capacity, abnormal features, and slight growth of the beard relative to the hair on the head. Lombroso's work has been of great influence, but the general verdict is that the criminal type has not been established. Lombroso has been a constant and versatile writer. For many years he has been an editor of *Archivio di psichiatria antropologia criminale e scienze penali*. Among his works are: *Ricerche sul cretinismo in Lombardia* (1859); *Genio e follia* (1864); *Studi clinici sulle malattie mentali* (1865); *Sulla microcefalia e sul cretinismo con applicazione alla medicina legale* (1873); *L'amore nel suicidio e nel delitto* (1881); *L'uomo delinquente* (1875); *Delitti di libidine* (1886); *L'uomo di genio in rapporto alla psichiatria* (1889); English translation, *Man of Genius* (London, 1891); *Sulla medicina legale del cadavere* (2d ed. 1890); *Palimsesti del carcere* (1891); *Trattato della pellagra* (1892); *La donna delinquente* (1893); *Le più recenti scoperte ed applicazioni della psichiatria ed antropologia criminale* (1894); *L'antisemitismo e le scienze moderne* (1894); *Genio e degenerazione* (1897). Many of his books have been translated into French and German.

LOMÉNIE, lŏ′mâ′nē′, Louis Léonard de (1815-78). A French author, born at Saint Yrieix. He studied at Avignon, and in 1845 was appointed professor of French literature at the Collège de France. His first literary work was a series of biographical sketches, published under the title *Galerie des contemporains illustres par un homme de rien* (1846-47). In 1864 he was appointed professor of French literature in the Ecole Polytechnique, and became a member of the French Academy. His chief work is *Beaumarchais et son temps* (1855), marked by much scholarly research. He also wrote *La comtesse de Rochefort et ses amis* (1871); *Esquisses historiques et littéraires* (1878); and *Les Mirabeau* (1879).

LOMÉNIE DE BRIENNE, de brē′ĕn′, Etienne Charles de (1727-94). A French cardinal and politician, born in Paris. He became Archbishop of Toulouse in 1763, of Sens in 1788, and in the latter year cardinal. In 1770 he was elected a member of the Academy. He was friendly to the Encyclopædists, and his orthodoxy was suspected by his contemporaries. He was made Comptroller-General of the Finances in 1787, to succeed Calonne, and Prime Minister in 1788; proved to be unequal to the task set him; and after having become involved in contests with the Parlements and been unable to save France from grave financial difficulties, was dismissed in 1788.

LOMMEL, lôm′mel, Eugen von (1837-99). A German physicist, born at Edenkoben, in the Palatinate. He studied mathematics and physics at the University of Munich from 1854 till 1858, and in 1860 became instructor in physics at the Cantonal School of Schwyz, in Switzerland. Five years afterwards he removed to Zurich, where he taught mathematics in the polytechnical school, and in 1867 returned to Germany to take a position in the agricultural academy at Hohenheim. The next year he accepted the chair of physics at the University of Erlangen, where he remained until 1886, when he was appointed to the same chair at the University of Munich, in which city he became a member of the Academy of Sciences. Among his publications are: *Studien über die Besselschen Funktionen* (1868); *Wind und Wetter* (2d ed. 1880); *Das Wesen des Lichts* (1874); *Lehrbuch der Experimentalphysik* (2d ed. 1894); and *Georg Simon Ohms wissenschaftliche Leistungen* (1889), which was translated by W. Hallock under the title *The Scientific Work of George Simon Ohm* (Smithsonian Institution Report, 1891).

LOMOND, lŏ′mond, Loch. The largest lake of Scotland, situated in the counties of Dumbarton and Stirling (Map: Scotland, D 3). It is about 23 miles long and its width varies from 5 miles at the southern extremity to less than 1 mile at the northern end. The depth varies from 20 to 600 feet. It is surrounded by mountains (one of which is Ben Lomond) and wooded hills, and is celebrated for its picturesqueness. It contains a large number of wooded islets and is navigated by steamers. The outlet of the lake is the Leven, a tributary of the Clyde.

LOMONOSOFF, lŏ′mô-nŏ′sŏf, Mikhail Vasilyevitch (1711-65). A Russian poet, philologist, and scientist. He was the son of a well-to-do fisherman of Denisovka, near Archangel. In 1729 he ran away to Moscow, where he entered a classical school in 1731; in 1736 he was sent to the Academic Gymnasium at Saint Petersburg, and later in the same year, with two other students, to Germany. From 1736 to 1739 he was at Marburg under the tuition of the famous mathematician and philosopher Christian Wolff. Then for two years he studied metallurgy at Freiberg. Married to a German girl in 1740, he returned to Saint Petersburg, and was appointed adjunct in chemistry and physics (1742), and professor of chemistry in 1745. His first successful verse was his *Ode on the Capture of Khotin* (1739), which he sent from abroad, along with a *Letter on the Rules of New Russian Versification*. He left numerous odes, epigrams, dramas, etc., mostly in the pseudo-classical style; his importance in Russian poetry is due to the new versification he introduced. His greatest services to Russia lie in the sphere of philology: his *Russian Grammar* (1755), an essay on *The Importance of Ecclesiastical Books for the Russian Tongue* (1755), and his *Rhetoric* (1748) have laid down the very foundations of the latter-day Russian by drawing a distinct line of demarcation between Russian and Church Slavonic. For this he is deservedly called 'the father of new Russian literature.'

The best edition of Lomonosoff's works is that of the Imperial Academy of Sciences, with a commentary by the Academician Sukhomlinoff. Only four volumes have appeared (Saint Petersburg, 1891-98). The best biography is by Pekarski in his *History of the Academy of Sciences*, vol. ii. (Saint Petersburg, 1873).

LOMZA, lôm′zhȧ. A small government of Russian Poland, bounded on the north by Prussia; area, about 4079 square miles. Its surface is mostly flat and partly marshy and to some extent covered with forests. It is watered by the Narev and the Bug and has a moderate climate. Agriculture engages the attention of most of the inhabitants. Population, in 1897, 585,781, composed principally of Poles and Jews.

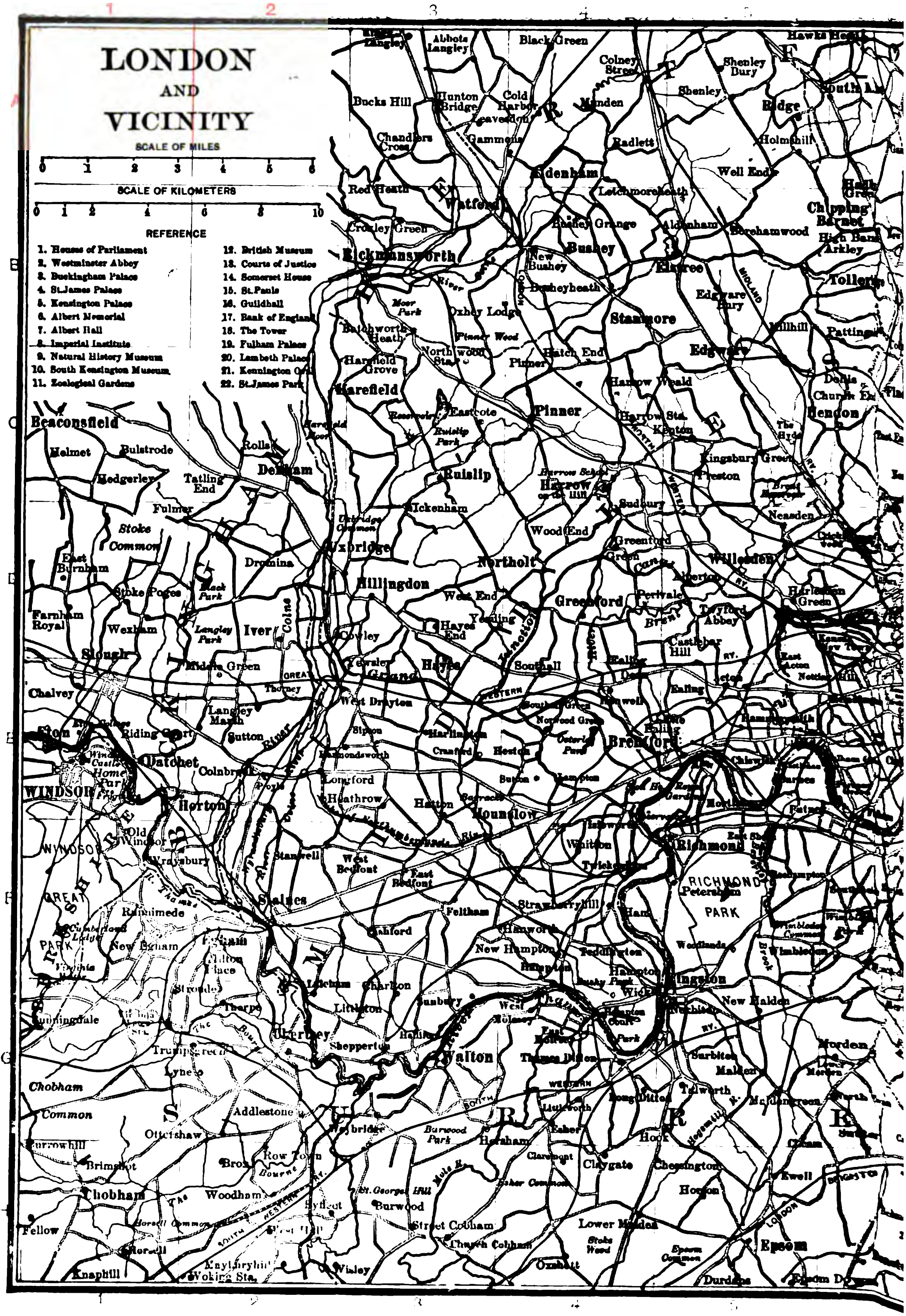
LOMZA. The capital of the government of the same name, situated on the Narev, an affluent of the Bug, 96 miles northeast of Warsaw. It has a gymnasium, a theatre, and Government buildings (Map: Russia, B 4). Its industrial activity is on a small scale. Population, in 1897, 21,400, chiefly Poles and Jews. Lomza existed as early as the tenth century, and was a place of considerable commercial importance in the sixteenth century.

LONDON, lŭn′don (British *Lundayn*, or *Lundein;* Saxon *Lundon*, *Lundone*, and other forms; in Tacitus and other Latin writers, *Londinium*, and *Lundinum*. Various derivations have been assigned to the name, among which is the old British *lyn-*, lake, and *din*, town, a landing-place; 'as until recent dates, the south side of the river was often a lake in some parts and a swamp in others, the name might easily be changed from *Lyndin* to *London* and be descriptive of its local position'). The capital of the United Kingdom of Great Britain and Ireland, and the largest city in the world. It is situated at the head of tidewater on the river Thames, where in the days before the Roman occupancy there was a convenient crossing place, the swamps on the south and the forests on the north being so situated as naturally to cause the northern and southern routes to converge upon this crossing, with the result that a thriving town or trading point was developed. The parallel of latitude of 51° 30′ N. bisects the city.

London occupies both banks of the Thames River about 50 miles above its estuary, the river, spanned by numerous fine bridges, flowing through the more southern part of the city with sluggish current and in long, winding reaches, its breadth being from 600 to 900 feet. Below London the land adjoining the Thames is flat, low, and marshy; and the site of the city, whose special characteristic on the left or northern bank of the Thames is that of a gently undulating plain, is the first upland above the estuary, and a particularly healthful and favorable position for urban development. Most of the city stands upon the sands and gravels of the glacial epoch, which are underlaid by the London clay that outcrops in some localities. The Fleet River and all the other streams that reached the Thames within the present city limits have disappeared in the sewerage system of the metropolis.

Many factors have contributed to make the greatness of London and its supremacy in the trade of the world. In the course of some centuries, and particularly of the last century, the Thames was deepened and provided with adequate dockage, so that the port of London was made available to the largest shipping of the world. From its docks extends an unsurpassed waterway by river and sea to all the coasts of Northwest and West Europe, always one of the most important elements in the trade of Great Britain. Its southerly maritime position, in the best-developed part of the British Islands, gave it the mastery both in the home and foreign trade; and from the time when Alfred the Great made London the capital of his kingdom, it became the great centre of British social and political interests. With the growth of its world-wide business relations and the greater intensity of its industrial activity the centrifugal tendency of its population increased. In 1888 London was politically restricted to London County, made up of parts of Middlesex, Surrey, and Kent, covering an area of 118 square miles, and for administrative purposes, besides the nucleus known as the City of London, was divided into the metropolitan boroughs of Battersea, Bethnal Green, Camberwell, Chelsea, Deptford, Finsbury, Fulham, Greenwich, Hackney, Hammersmith, Hampstead, Holborn, Islington, Kensington, Lambeth, Lewisham, Marylebone, Paddington, Saint Pancras, Poplar, Shoreditch, Southwark East, Southwark West, Stepney, Stoke Newington, Wandsworth, Westminster, and Woolwich. Most of these, formerly villages and suburbs of historical interest, are treated under separate titles, to which refer. But many square miles of houses had already been added to the outer edge of this district; the market-roads leading into the city were streets lined with houses; suburb after suburb became merged with the city by the building operations that overtook and passed beyond them. Thus the large towns of Edmonton, Enfield, Hornsey, Tottenham, and Willesden in Middlesex, Croydon and Wimbledon in Surrey, and East and West Ham, Ilford, and Walthamstow in Essex (qq.v.), ranging in 1901 from 40,000 to over 260,000 population, and scores of smaller places, practically lost their identity, because they became merely parts of the one great urban aggregate.

London County and these wide-spreading accretions on all sides of it form Greater London. This area, which is accurately defined by the boundaries embracing the Metropolitan and City of London police districts, covers an area of 693 square miles, and had a population in 1891 of 5,633,806, and in 1901 of 6,580,816. It includes all the territory within a radius of about 14 miles from Trafalgar Square, the county of Lon-



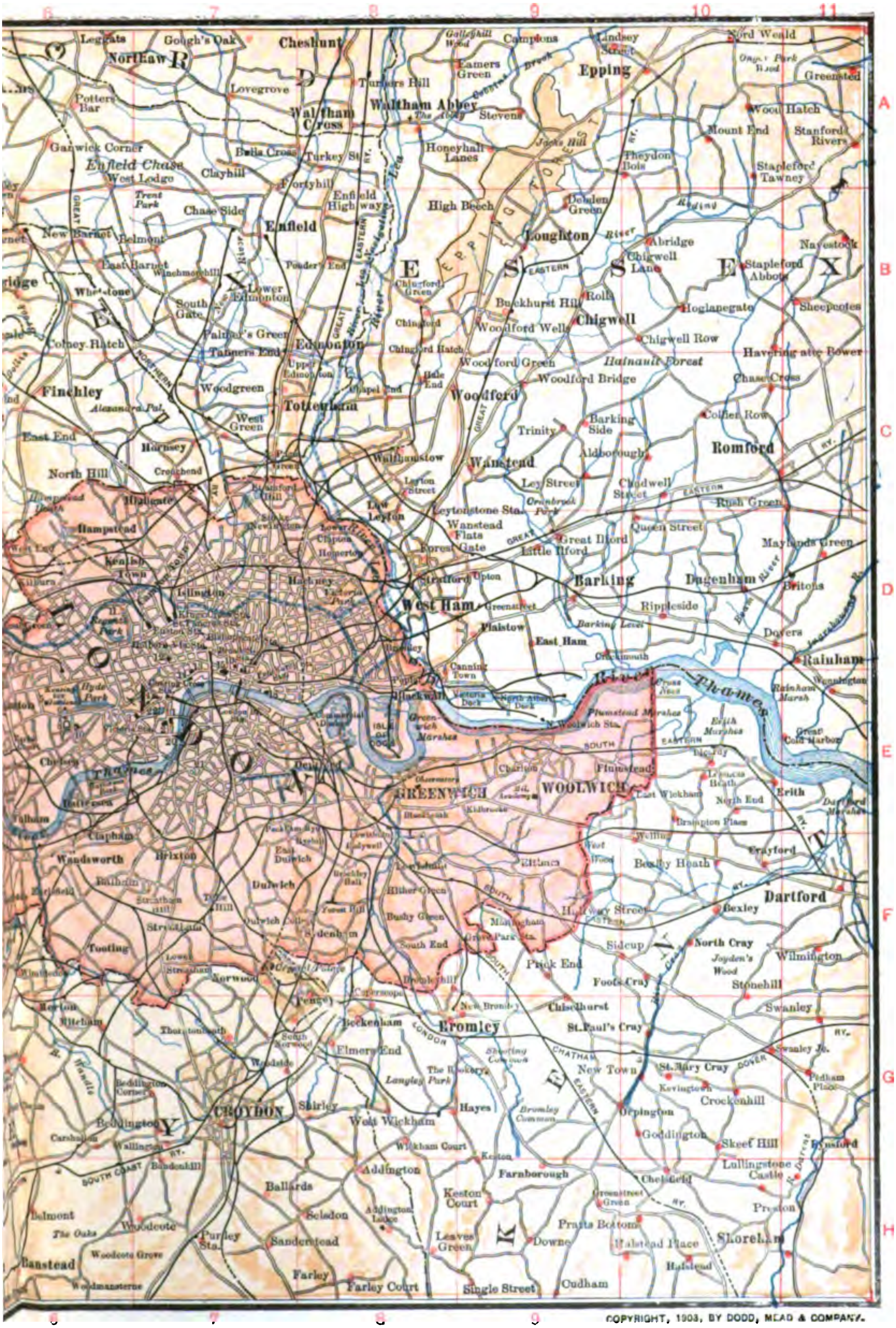
LONDON AND VICINITY

SCALE OF MILES

SCALE OF KILOMETERS

REFERENCE

1. Houses of Parliament
2. Westminster Abbey
3. Buckingham Palace
4. St. James Palace
5. Kensington Palace
6. Albert Memorial
7. Albert Hall
8. Imperial Institute
9. Natural History Museum
10. South Kensington Museum
11. Zoological Gardens
12. British Museum
13. Courts of Justice
14. Somerset House
15. St. Pauls
16. Guildhall
17. Bank of England
18. The Tower
19. Fulham Palace
20. Lambeth Palace
21. Kennington O
22. St. James Park



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don, the whole of Middlesex, and parts of Surrey, Kent, Essex, and Hertfordshire. For the Government postal and telegraphic service, the Metropolitan area is divided into eight postal districts, the Eastern, Northern, Northwestern, Western, Southwestern, Southeastern, East Central, and West Central, which are respectively designated by their initial letters. While extending beyond the boundaries of the administrative county of London, the postal districts do not embrace the whole area covered by the Metropolitan police districts.

As in all large cities that include in their limits opportunities for further growth, a considerable percentage of the surface of Greater London is not yet utilized for streets and building-sites. The area under crops and grass in 1899 was 12,054 acres.

Aspects of the City. There is no point of vantage in London where the whole city may be seen even on the clearest day. The view from the top of the Fire Monument, in the centre of the city, still reveals the roofs of numberless houses on the horizon. London has grown not like most great cities around a centre, but is the outcome of the merging together of many towns and villages. These various centres differed from one another, and gave much of their distinctive personality to the districts in the great city which they occupy. Thus London is an assemblage of urban districts, each differing from the other and having its distinctive appearance and history. Warehouses are the predominant feature in one region; banks or factories, palaces, villas, or tenement-houses each give a distinct individuality to other districts. The impression which the city as a whole makes upon the visitor is not entirely favorable. The streets are narrow and the more densely peopled districts in particular lack sun and air. It is a giant among cities, but in beautiful, attractive aspects it is far inferior to many others. It has many fine buildings, but in its larger features it is positively ugly when compared with Paris, for example—which, particularly under the régime of Napoleon III., waxed not only in size and importance, but also in its æsthetic aspects. Love for the practical and useful predominated over love for the beautiful in the making of London. The prevailing cloud, mist, and fog in the atmosphere of England, due to the neighboring seas, are intensified in this enormous aggregation of houses and inhabitants; and the exclusive use of bituminous coal both for domestic and industrial purposes fills the air with smoke which smirches the house walls and gives the whole city a dingy aspect. The greatest development of the city from the small original nucleus near the Tower has been to the north and west, the Surrey or southern side of the Thames embracing only about one-third of the present Metropolitan District.

Climate. London is an exceptionally healthful city apart from the imperfections still existing in the sanitary system, and the somewhat deleterious influences of smoke and fog which aggravate diseases of the respiratory organs. These influences, however, are not now believed to be so unfavorable as was formerly supposed. The mean annual temperature is about 50° F., ranging from 39.9° for the quarter ending in March to 60.4° for the quarter ending in September. The annual fall of rain is nearly 25 inches, while at Plymouth, in the west, it is 40 inches.

Streets. Most of the streets are narrow and many of them are inadequate, particularly in the large business districts, where the congested conditions of the street traffic are a great disadvantage. Some of the most important streets are being widened, but no comprehensive scheme to relieve the uncomfortable crowding in the Strand, Fleet Street, Oxford Street, Holborn, Cheapside, and other leading streets has yet been adopted. The finest promenade in London is along the Thames Embankment, which is buttressed up by a wall of large granite blocks, and affords one of the most spacious thoroughfares in London. Regent Street, where the most fashionable shops are situated, has ample width, but its architecture is plain and monotonous. Buildings of more imposing quality have been erected in considerable numbers on Oxford Street, which ranks next in importance among the business thoroughfares. Piccadilly is famous for the shops that line its eastern half and the fine dwellings and clubhouses along its western extension. Among other familiar streets, many of which are treated under separate titles, are Fleet Street, mainly devoted to the newspaper trade; Paternoster Row, near Saint Paul's Cathedral, the headquarters of the book trade; Downing Street, containing the new Government offices; Holborn Viaduct, an elevated street overcoming the steep descent of Holborn Hill between Newgate and Hatton Garden, and lined with fine stores; Bow Street, with its celebrated police court; the Haymarket, with its theatres and hotels; Bond Street, the seat of the retail jewelry trade, with fine stores; and Pall Mall, a street of handsome buildings and the centre of club life.

Buildings. The greatest recent innovation in the building enterprises of London is the multiplication of very large and handsome hotels, the increasing number of theatres which far surpass the old buildings in architecture and in the safety, convenience, and beauty of their interior arrangements and fittings, and the construction of apartment houses and flats, formerly unknown in London. All parts of London are alike in the fact that most of the houses are built of brick, and all are blackened by the smoke-laden fogs, though the West End suffers least from this discomfort. There are no quarries in the neighborhood, and for this reason the ordinary houses are of brick, while the stone for the finer buildings is brought from a great distance. The buildings in 1901, in the administrative county of London, included 571,768 inhabited and 40,069 uninhabited structures and 4624 in course of erection.

London has expanded principally toward the west, as the purifying winds usually blow from that direction. The fashionable and wealthy live in the West End (the neighborhood of Hyde Park and Kensington Gardens), and thus escape most of the smoke-laden air of the factory districts. Here are the palatial residences of the aristocracy who deserted their residences farther east in the districts now occupied by commercial London. Just east of the old City, now the financial centre of London, and immediately in contact with it, are the poorest quarters of London (the East End), where myriads live in poverty and many in misery; here the annual death-rate is from 30 to 60 for every 1000 persons, want of work and bread greatly increasing the mortality. Some of the narrow streets in the Rotherhithe, Bermondsey, and Lambeth districts, south of the Thames, are also the abodes of the poorer classes.

Extending far north of the old City are tens of square miles of houses of the common English type occupied by the lower middle classes, who live comfortably on modest incomes; and on the outskirts of the city to the north and east are great districts chiefly inhabited by artisans living in small but neat houses. In the northwest are many more square miles with higher and larger houses, many of them architecturally pretentious, the homes of the wealthier middle class. Thousands of these houses are luxurious homes.

The most striking edifices in the City of London proper, which embraces only 673 acres, are banks, exchanges, warehouses, and offices, among which still stand a number of edifices which were the palaces of the nobility before commerce drove them farther west. During the day more than 1,000,000 human beings are working within the narrow limits of the old City. At night its only inhabitants are the caretakers with their families and the police. Only 26,923 persons lived in the old City in 1901.

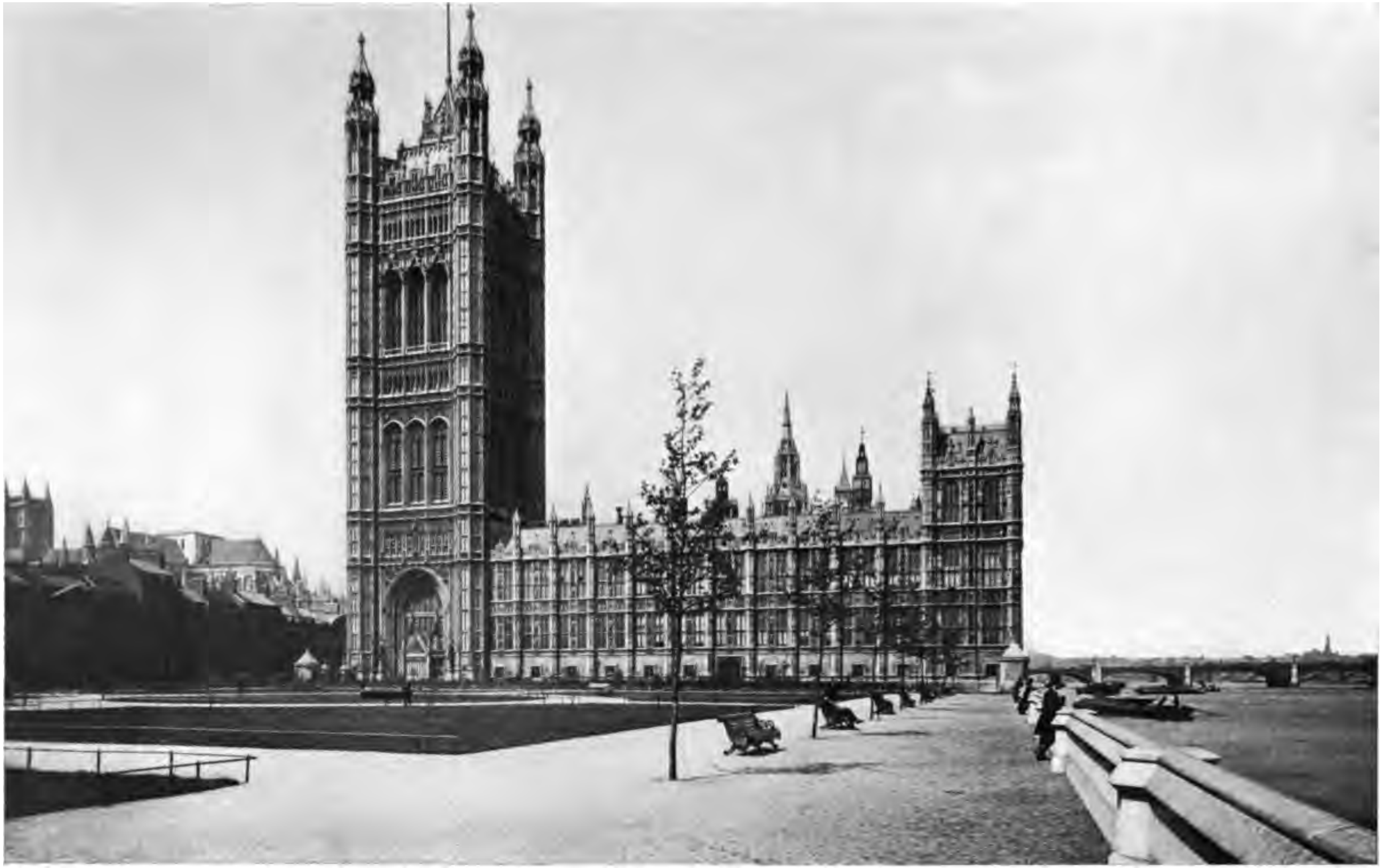
Two of the royal palaces, once in the heart of the fashionable quarter, are now considerably east of the aristocratic part of London. These are Saint James's Palace (q.v.), lying directly eastward of Belgravia, the most fashionable part of London, and Buckingham Palace, isolated by the parks in front of it and the royal private gardens in the rear, but within sound of the roar of commercial Victoria Street. Other notable palaces are Marlborough House (q.v.), the residence of the Prince of Wales; Kensington Palace, (q.v.) on the west of Kensington Gardens; Lambeth Palace (q.v.), the archiepiscopal residence of the primates of England; and Whitehall (q.v.), the ancient palace of the archbishops of York, replete with historic associations, and now used for public offices.

The Tower (q.v.) is the most venerable of the old buildings. It stands on the banks of the Thames at the southeast corner of the old City. The ancient walls, the fine building called the White Tower, Saint John's Chapel, one of the finest specimens of Norman architecture in Great Britain, and other structures of more modern date stand amid a garden and drill ground every inch of which is historic. This scene of former crimes and suffering is now used as an arsenal and armory, and the crown jewels of the Kingdom are kept there. Westminster Abbey (q.v.), less ancient than the Tower, was built in the city of that name long since merged with London. In spite of additions and restorations not approved by the architectural taste of to-day, the Abbey remains one of the most perfect specimens of Gothic architecture in England. Its interior is strikingly beautiful, though much crowded with monuments reared to royalty and hundreds of the great men of the country. Among the largest Gothic edifices in the world are the Houses of Parliament, standing on the banks of the Thames, with a river front of 940 feet, covering eight acres and containing more than 1000 rooms and two miles of corridors. The chief external features are Saint Stephen's or the Clock Tower, 318 feet high, containing the great bell Big Ben; the Middle Tower, 300 feet high; and the Victoria Tower, 340 feet high, with its handsome and lofty royal entrance. The chief interior features are the House of Peers, the House of Commons, Westminster Hall, part of the ancient Westminster Palace of the Anglo-Saxon kings, and the scene of numerous historical events of importance, the octagonal central hall with its noble monuments, the libraries, and the numerous courts. The dome of Saint Paul's Cathedral (q.v.) rises high above London, is visible from most parts of the city, is the first object to impress the stranger, and is the noblest of the monumental structures. Here also are many monuments to military and naval heroes, artists, and other great men of England. The Mansion House in the Poultry, the official residence of the Lord Mayor, is an eighteenth-century structure in a Corinthian style of architecture; the Guildhall (q.v.), or City Council Hall, dates from 1411; the Royal Courts of Justice, a magnificent block of Gothic buildings on the Strand, were opened in 1882. The luxurious club-houses are naturally grouped in the district where they are most accessible at once to the Parliament buildings and Government offices, the financial centre of the old City and the aristocratic West End. The clubs are situated in the district between Saint James's Park on the south, Piccadilly on the north, and Regent Street on the east. Most of the club buildings are impressive in proportions and architecture and are classed among the ornaments of London.

The more prominent of the theatres, of which there are over thirty-six in the county district and several in the suburbs, are the Royal Italian Opera or Covent Garden Theatre, in Bow Street; Drury Lane Theatre; the Lyceum, The Strand, The Savoy, The Adelphi, and the Gaiety, all in the Strand; the Haymarket; Her Majesty's Theatre, opposite the Haymarket; The Princess, in Oxford Street; The Criterion, in Piccadilly; and Daly's Theatre, in Leicester Square. The chief of the music halls are the Alhambra and the Empire, both in Leicester Square, and the South of London Palace of Amusements, in London Road, holding 5,000 persons.

The city is adorned throughout with numerous monuments, statues, and memorials of eminent personages, the more remarkable being the Albert Memorial, between Queen's and Prince's gates, Kensington Gardens, opposite Albert Hall, a magnificent Gothic monument designed by Sir G. Scott and erected at a cost of $600,000; the Nelson Column, fountains, and other statues in Trafalgar Square; the colossal Statue of Achilles or Guard's Monument, at Hyde Park corner, to the Duke of Wellington; the National Memorial to Queen Victoria, in course of erection in front of Buckingham Palace; and Cleopatra's Needle, on the Thames Embankment, the companion Egyptian obelisk to the one in Central Park, New York.

MUSEUMS AND LIBRARIES. London is especially rich in museums. They are among the finest in the world; and some of them, devoted to specialties, are particularly notable. Perhaps the most famous of modern collections are those of the British Museum (q.v.), a vast edifice filled with countless treasures of art and nature. Many of its galleries are crowded with sculptures. The genius of Greece may be better studied in London than in Athens since Lord Elgin brought his famous collection of marbles to London in 1816. The most interesting and admirable examples of the sculptural arts of Egypt, Assyria,



LONDON
THE HOUSES OF PARLIAMENT
FROM THE SOUTH

and other parts of the ancient world may be seen in these galleries. The library contains about 2,000,000 volumes. Since the Museum was founded in 1753, the British nation has expended about $40,000,000 in collecting, housing, and caring for these treasures. The National Gallery in Trafalgar Square includes more than 1500 paintings, the old masters being well represented. This gallery has large funds at its disposal, and is thus enabled to secure many of the choicest specimens of European art. The Royal Academy of Art occupies a section of New Burlington House, facing Piccadilly, and is noted for its collection of rare works and for its annual exhibition of paintings and sculptures. The Society of Royal Academicians, founded in 1768, consists of 40 Royal Academicians, 30 Associates, and 2 Associate Engravers.

The Victoria and Albert Museum, formerly the South Kensington Museum, has a great variety of the choicest art products. It is not only a museum, but also the most important school of art and industrial science in Great Britain. Separated by Exhibition Road is the fine block containing the buildings of the Imperial Institute, with its permanent exhibition of the products, manufactures, and industries of the Empire; the Natural History Museum, with its complete collection; the Royal College of Music; and the Royal Albert Hall of Arts and Sciences, accommodating 8,000 persons, and containing one of the largest organs in the world.

Among the special museums and collections offering admirable facilities for students and scientific workers are the Anatomical Museum in the College of Surgeons, the Geological Museum, and the museums of the Royal Geographical Society and the Royal Society, at the head of scientific organizations in Great Britain; and of the Anthropological Institute and the Geological and Linnæan societies. About 1,000,000 persons every year visit the most complete collection of living animals in the world, installed in Regent's Park and the property of the Zoölogical Society. The beautiful gardens of the Horticultural and Botanical societies have admirable collections, which, however, cannot be compared with the unsurpassed exhibits at Kew Gardens, which are probably the most varied and the richest in the world. The Crystal Palace (q.v.), south of London, has many beautiful models of architectural and art works, but the great building in the midst of a garden of 200 acres is maintained more for recreation than for instruction. The People's Palace for East London, on the Mile End Road, is an immense structure comprising a large amusement hall, free library, reading-rooms, technical college, engineering workshops, chemical and physical laboratories, school of art, a winter garden, gymnasium, and swimming-baths, all devoted to the intellectual and material advancement, the recreation and amusement of the vast artisan population of the East End. Many other societies and institutions have large libraries, most of which are accessible to the public.

Parks and Squares. London has many squares and open places, but they are by no means adequate for so large a population. Among the principal squares are Trafalgar Square, with fine monuments, and surrounded by handsome buildings, including clubs, hotels, the National Gallery, the National Portrait Gallery, the Royal Humane Society building, and the fine church of Saint Martin's-in-the-Fields, containing the graves and monuments of many celebrities; Lincoln's Inn Fields, the largest square in London, surrounded by offices of the legal fraternity; Hanover Square, with Saint George's Church, famous for its fashionable weddings; and the aristocratic Grosvenor, Cavendish, Portman, and Berkeley squares. In London County there are thirteen parks, with a total area of 2900 acres, of which the most thronged is Hyde Park, 390 acres, extending in the West End from Mayfair to Kensington Gardens. This park, surrounded by fine residential districts, has a beautiful lake, broad avenues, shaded by large trees, and fine expanses of grass with flower-beds and clumps of shrubbery. In the height of the social season, when the avenues are crowded with handsome equipages and many thousands of pedestrians throng the walks, probably no park in the world equals the brilliant and varied scene that Hyde Park presents. Farther west are Kensington Gardens, more thickly planted with trees and plants than is Hyde Park. Regent's Park, in the northwest, is famed for its zoölogical and botanical gardens, large crowds being also attracted there in summer by the cricket matches to which the northern part of the park is devoted. Saint James's Park and Green Park, not far from Trafalgar Square, are among the old royal parks, long since open to the public. Besides other smaller parks, the gardens along the Thames Embankment are very popular; playgrounds here and there are maintained for children, and disused churchyards, with various squares and semi-private gardens, add to the number of breathing-places. Excursions to Epping Forest and many other delightful rural districts are very largely patronized.

Water. The people do not yet enjoy an adequate supply of pure water. The main sources of supply are the Thames, above London, and the Lea River, private companies leading the water into the city and distributing it in all directions. Their aqueducts, reservoirs, and other appliances have cost an enormous sum of money; but the companies have not sufficiently guarded against the introduction of deleterious elements, and the city authorities as yet have not succeeded in getting the management of the water-supply into their own hands. Although the water is carefully filtered, it is said to contain some amount of sewage pollution. The question of improving and augmenting the water-supply is one of the serious problems receiving constant attention.

Sewers. Nearly $40,000,000 has been expended on the sewerage system of London. The length of the main sewers is over 87 miles. They discharge into outfall works at Barking on the north of the Thames and at Crossness on the south side, where the sewage is chemically treated and rendered innocuous, the overflow emptying into the river from 11 to 15 miles below London Bridge, and the sludge being taken 50 miles out to sea. It is only within the past fifty years that the provisions for removing and disposing of the sewage of London have, in a sanitary sense, been at all adequate.

Markets. The markets of London are among the great sights of the city. Many tourists leave their hotels at dawn to see the remarkable display of fruits, vegetables, and flowers in Covent Garden. For centuries the householders obtained their supplies from these markets. Enormous quantities of provisions and vegetables, fruits and flowers are still purchased by consumers at the markets; but retail stores are now found in all parts of the city, and the main trade of the markets is in supplying them with the commodities they sell to householders. The Smithfield market is the great source of meat-supply for central London. The building occupies about three acres. The Leadenhall market is the principal market for poultry and game. Billingsgate is famous as the largest fish market in the world. Covent Garden market is more important than any other in the sale of vegetables and flowers. At Islington is a large market exclusively devoted to domestic cattle, while foreign cattle are sold at Deptford. The coal market is the largest establishment for the sale of coal in the world. The poorer classes of the East End obtain nearly all their cheap vegetables and other supplies from street venders, the gross amount of whose annual trade is about $17,000,000.

POPULATION. The population of Greater London, in 1901, was 6,581,000. The population of the county and city of London was 4,537,000. Greater London contains more than one-fifth of the total population of England and Wales. More than half of the inhabitants were born in London, and the remainder in other parts of Great Britain and Ireland, excepting about 3 per cent. who are natives of the British colonies and foreign countries. Germans, French, Dutch, Poles, and Scandinavians are particularly well represented; the number of Jews is more considerable than in any other city of England, and near the docks in the East End are not a few representatives of the Chinese, Hindus, and other Oriental peoples. Most foreigners who make their homes in London have gone there in search of better business opportunities, but their number is proportionally not so large now as it was three centuries ago.

The death-rate is smaller than in many of the large cities of the world. The average mortality in 1881 was 21.6 per 1000, or less than that of the twenty other largest towns of England; in 1899, with a total mortality of 88,063, in London County, the death-rate was 19.4 per 1000. In the same year the births numbered 133,134, or 29.3 per 1000. The birth-rate largely exceeds the death-rate, and about three-fourths of the increase in London population is derived from this source. The death-rate has steadily declined since the beginning of the 19th century, when it was first exceeded by the birth-rate. The number of marriages in 1899 was 41,876, or 18.4 per 1000 of the inhabitants—a little less than the mean rate in the ten years, 1870 to 1879. In 1889 the number of illegitimate births was 4749, or 3.6 per cent. of the total. The paupers of all classes (1899-1900) numbered 120.912. One of the greatest conveniences provided by the Government for the common people is the numerous public baths and wash-houses, which are patronized by over 5,000,000 bathers and washers every year.

EDUCATION. Over 500.000 pupils attend the common schools, 975 in number, which are scattered all over the city. These are the public schools of London, under charge of the School Board, and costing the taxpayers $16,938,330 in 1900. The courses of study include all the common branches and are intended to fit the pupil for the ordinary vocations of life. There are also a large number of middle-class schools, with more extended courses of study, which are supported by churches, corporations, societies, or endowments. Some of the endowed schools, such as Saint Paul's and Charterhouse, have existed for centuries. London is not a great centre of university instruction like Oxford and Cambridge. The University of London, previous to 1900 merely an examining body, embraces more than a score of institutions of all kinds, at the head of which are University College and King's College. The lectures of the University Extension are well attended, and are a useful feature of the free-education system. A number of large industrial schools are supported from the public funds. Nowhere in the world are there finer facilities for obtaining a thorough training in medical and surgical science than in the College of Physicians, the College of Surgeons, the other medical schools, and the hospitals of London. Medical students are attracted thither from all parts of the world. The study of law is pursued at the Inns of Court (q.v.). Although London is not a great centre of university education, it may justly be regarded as the scientific and literary centre of the British Empire—a position given to it by its numerous scientific societies, with their large collections, its great publishing houses, which issue more books than all the rest of Great Britain, and its newspapers and periodicals, about 700 in number, which excel in influence and in literary quality.

COMMUNICATIONS. Such immense multitudes as throng the leading thoroughfares of London during business hours are seen in very few other streets of the world. From the spacious stations of the Metropolitan and other railroads about 1,000,000 persons are emptied into the streets every morning. Every day over 100,000 foot passengers and over 20,000 vehicles cross London Bridge, the chief means of communication between the north and south banks of the Thames. Such streets as the Strand, Cheapside, Ludgate Hill, Cannon, and Lombard streets on week-days appear to be filled with a mass of omnibuses, cabs, carriages, truck-wagons, and pedestrians. The omnibuses, though comparatively slow, carried 265,500,000 passengers in 1900. Thousands of cabs and carriages are also largely patronized, for fares are cheap. A whistle blown on any door-step in London is likely to bring a cab immediately.

The more rapid means of communication are afforded by the underground railroads, which place all quarters of the town in communication with one another, and connect London with the great trunk lines which send trains to every part of the Kingdom. The underground railroads have numerous stations scattered throughout the larger part of London, and carry over 160,000,000 passengers a year. The trunk lines have most of their stations, some of them palatial structures, not on the outskirts, but in the very heart of the city. The chief of these are Waterloo, Charing Cross, Victoria, London Bridge, Paddington, Euston Square, Saint Pancras, King's Cross, Broad Street, Liverpool Street, Bishopsgate, and Fenchurch Street. In 1901 there were over 101 miles of tramways and electrical street railroads in operation, throughout the metropolitan area, with several miles more under construction or authorized. Rapid transit is thus afforded to every part of the business and manufacturing districts. It is chiefly due to these facilities for rapidly reaching the business centres that London has been able to spread itself far over the surrounding country, to the great advantage of public health. The result is that most of the people live in houses only two to five stories in height, instead of being packed together in buildings of great altitude, as in some other cities. Street cars or trams do an enormous business, chiefly in the outlying districts. The Thames has also been a great means of communication between the East and West of the city, though the service of the river passenger boats is declining. Four tunnels under the Thames—the Thames, Blackwall, and Greenwich tunnels, and the Tower Subway—form continuous streets between North and South London. The Rotherhithe tunnel is under construction in 1903. Among the bridges proceeding from East to West are the Tower Bridge, London Bridge, Blackfriars Bridge, Waterloo Bridge, Charing Cross Bridge, Westminster Bridge, Lambeth Bridge, Vauxhall Bridge, Chelsea Bridge, Albert Bridge, and Battersea Bridge.

THE PORT. The port extends from London Bridge to the Nore Lightship in the estuary, 50 miles. The dockage facilities are now embraced between the Tower Bridge, at the Tower of London, and Tilbury Docks, 35 miles down the river. Previous to the nineteenth century the business of the port was carried on under many disadvantages. Small sailing vessels were tied up near the shore, and the larger ones were anchored in the stream. Lighters carried the cargoes between the quays and the shipping. The manipulation of freight was under difficult conditions. The best wharfage facilities were provided by the so-called Legal wharves, between London Bridge and the Tower, private property, whose owners charged exorbitant rates. Vessel-owners and merchants were not able to free themselves from this monopoly or to secure authority to provide accommodations for themselves along the river till the last year of the eighteenth century, when the first of the artificial basins, the West India Docks, was built; this great improvement was soon followed by others, and the present dock system was rapidly developed. Most of the docks extend along the river-front on the promontories formed on the north and south shores by the winding course of the river between Tower Bridge and Woolwich. They are great artificial basins excavated a short distance back of the river, with which they are connected by deep and broad channels. The mightiest of steamships as well as numerous smaller vessels are moored at these docks. The word has come to mean in London not only an artificial basin, but also great warehouses on or adjoining the docks, and large railroad and wagon facilities for the receipt or removal of freight. The principal docks on the north bank of the Thames are the West India docks (300 acres), the Millwall docks (100 acres), the East India docks (27 acres), the London docks (120 acres), the Victoria and Albert docks, nearly three miles in length, and (35 miles down the river) the Tilbury docks. The great docks of the south bank of the Thames are the Surrey and Commercial docks (350 acres). The Tilbury docks, opened in 1886, are not as large as some of the others, having a water area of only 55 acres, but having been built later than the other great docks, have some improved facilities. Freight-cars load and unload at the ship's side; and a vessel unloaded at one of the import docks needs only to be moored on the other side of the same dock to be loaded at an export dock. The London docks have many conveniences. Some of them have rerefrigerated cellars for the temporary storage of frozen-meat imports. The fact that most of the shipping business of the port is carried on in these interior basins deprives the river-front of much of its former appearance of activity. Passengers on the Thames boats may steam down the river from the Tower and see very few sea vessels excepting those that are passing up or down the river. The large number of vessels in the docks where thousands of men are loading or discharging cargoes are hidden from view by the buildings along the banks. The largest vessels in the ocean trade are able to pass between the sea and the docks only at high tide, though enormous sums have been expended in deepening the river for modern shipping. The channel up to Tilbury is 25 to 26 feet deep at low water. In recent years there has been a growing demand for further deepening of the river and the providing of other improvements. The number of ships visiting the port is increasing, chiefly on account of the enormous local market for products that London provides. The result is that port charges are very expensive and vessels are delayed in the transaction of their port business. Merchants complain that the shipping trade is being driven to other ports. The problem of increased facilities is receiving much attention from the Government. The enormous coasting trade tributary to London, double that of Liverpool, contributes to make the port the busiest in the world. On an average a vessel arrives in the port of London every ten minutes.

COMMERCE. The value of the total foreign trade of London has amounted for years past to considerably over $1,000,000,000 a year. In 1900 it was about $1,300,000,000. The average annual tonnage of over-sea shipping amounts to more than 16,000,000 tons a year. The tonnage of the over-sea vessels entering and clearing in 1900 was 16,700,727 tons. In recent years London, while practically holding its own in the amount of home products exported or commodities imported for domestic consumption, has lost a considerable part of its forwarding trade. The reason is chiefly because Hamburg, Rotterdam, Antwerp, Bremen, and Amsterdam, in the course of the large development of their shipping trade within the past fifteen years, have established many connections with foreign ports that they formerly did not possess; consequently, they do not now rely so much upon London for a part of their over-sea transportation. London, however, is still more thoroughly connected by direct lines of communication with all quarters of the globe than any other port in the world; and its business is greatly augmented by the fact that its coasting trade with the other ports of Great Britain is about equal to that of all the other ports together.

Three-fourths of the great aggregate of London's over-sea trade is imports, the exports being comparatively small. There are several reasons for this disparity between the import and the export trade. In the first place, London is the largest nucleus for the consumption of food-supplies and many other commodities in the world. The amount of foreign supplies brought in for consumption in the Metropolitan District is greater than the total imports of many large seaports. Vegetables are brought in from as far away as Spain and the Canary Islands. Then London, the centre of the railroad system of the island, is the largest distributing point for commodities purchased in the neighboring European countries for consumption throughout Great Britain. Nearly all British imports also that are of high value and small bulk come to London for distribution either inland or to foreign countries. London is the chief British market for most colonial wares, and some other foreign and colonial products, such as spices, indigo, cacao, jute, tin, hides, fur, ivory, precious stones, petroleum, and spirits. It is the largest market for tea and coffee, but is surpassed by Liverpool in imports of raw cotton, rice, and tobacco. More than one-third of the entire British import trade falls to London. It is second to Liverpool in the export of British manufactures and other products, but controls more than one-half of the country's export forwarding trade.

The most important and bulkiest article among London's imports is wool, which is sent direct to the metropolis from Australia, the Cape of Good Hope, and Argentina, to be sold at auction at the Wool Exchange, the largest of the world's wool markets. Great quantities of the fibre are reshipped to the European mainland, and important amounts are sent to the United States. The larger part of the foreign and colonial commodities reshipped from London go to other European ports.

Industries. More than 1,000,000 persons are engaged in manufacturing pursuits. Although London is not preëminent in special lines of production, as Birmingham, Leeds, and Sheffield are, it is still the leading manufacturing city of the Kingdom. The industries are widely distributed through the metropolis, but the great region of factories extends in a semicircle to the east and south of the City of London, from Clerkenwell through Spitalfields, Bethnal Green, Mile End, Rotherhithe, and Southwark to Lambeth; thus the Surrey side of the Thames, as well as the East End to the north of the river, is well represented in the manifold manufactures of the metropolis. About 20,000 men, in round numbers, are engaged in making machinery, 25,000 in the manufacture of furniture, 30,000 in the printing industry, 80,000 in making clothes, and over 6000 in weaving silk. Wall-paper, glass, pottery, musical and surgical instruments, jewelry, clocks, watches, and goldsmithery are conspicuous for the quality and quantity of their product. The leather, saddlery, and other leatherwares of London, produced chiefly on the south side of the Thames, have made a great reputation; and about 200 breweries turn out an astonishing quantity of beer and ale, the national beverages. Most of the breweries have sunk artesian wells and obtain an ample supply of pure water. Over 600,000 persons are employed in the building, fitting, and furnishing of houses. London was the great shipbuilding centre in the days of wooden vessels; but now that iron and steel have largely supplanted wood, the industry is much reduced, as more northern ports have the advantage of being nearer to iron and coal. Hundreds of other industries give employment to thousands of working people.

Finance. London is still the chief money centre of the world. The business of the great bankers is on Lombard Street and in its neighborhood. The centre of the banking business of the country is the Bank of England, the chief bank of deposit and circulation in Europe, housed in a plain, low building, covering four acres, and almost devoid of ornamentation except at the northwest corner, which was copied from a Roman temple. A detailed account of this institution will be found in the article **Bank, Banking.** The private and joint-stock banks number nearly 200, most of which are members of the Clearing House, where a daily exchange of drafts and checks is effected. The 3000 members of the Stock Exchange, near the Bank of England, buy and sell all the stocks and shares which are sanctioned by the governing committee.

The enormous accumulation of capital in the chief cities of the Kingdom results in great eagerness to find favorable opportunities for investment. Surplus funds tend naturally to London, where there is a constant demand for money to float enterprises in all parts of the world. It is to London that colonial projects, railroad and harbor development schemes, wildcat undertakings, and countless other enterprises, legitimate and illegitimate, from all quarters, look for the necessary funds. Many agents of London money-lenders and companies are scattered all over the world, looking for new fields for exploitation or inquiring into the merits of numerous enterprises that are seeking financial assistance. Information as to the prospects for safe investment in all parts of the world is constantly flowing into London. The money centres of other European countries have their agents in London, and keep closely in touch with this unequaled centre of finance.

Government. The governmental system of London has been evolved from centuries of experience as to the special needs of the metropolis, and differs greatly from the local government of any other city in the Kingdom. The British Government exercises the central control. Parliament defines the duties and powers of the local authorities and the areas over which their functions are exercised. Certain departments of the Government supervise and control the acts of the various local authorities. The consent of the Board of Trade, for example, must be obtained for any extension of the electric-lighting system. The Board of Education has power to withhold the Government grant unless the efficiency of the school system in each district is kept up to a certain minimum. No park or common may be inclosed without the consent of the Board of Agriculture. The Local Government Board, also a department of the general Government, has the widest supervision of the acts of the local authorities, and especially over the finances of the city. The local bodies cannot raise a loan without the consent of this board or a special act of Parliament.

The ancient City of London has its own government, handed down from the Middle Ages; its own sheriff, police, and courts; controls the bridges that connect it with South London, and exercises authority over most of the London markets, as they are in its territory. Its chief authorities are the Lord Mayor, twenty-six aldermen, and a common council composed of 206 members. The councilors are elected by the ratepayers; but the Lord Mayor, Sheriff, and some other officers are chosen by the guilds or livery companies. (See GUILD and COMPANY.) These number at present 76, though some represent trades that have long been extinct. They are very wealthy. A large amount of their income is spent in charity and entertainments of various kinds. The city government controls all the affairs of the ancient city, excepting questions relating to the main drainage.

Outside of the ancient city, the central authority is vested in the London County Council, whose jurisdiction extends over London County, but does not include the outlying circle of the urban district that has grown up around London County and with it forms Greater London. It, however, has authority throughout the entire urban district over those features of the public service that must be under central control, such as the main drainage or sewerage, the provision of parks, and the fire department. The police department is an exception, for the police are regarded as being as much a general British as a city force, and are directly under the control of the Home Office. The total police force numbered 15,769 in 1899.

The limitation in 1888 of London to a county around its ancient nucleus, divided into 29 administrative boroughs comprising 30 Parliamentary boroughs, returning 58 members, took effect in 1900. Each administrative borough has its mayor, aldermen, and common council, responsible only to the central Government, except in the matters of common interest above mentioned, which are under the control of the London Common Council.

There are many boards having special functions, such as the London School Board and the Metropolitan Asylums Board. For educational purposes the metropolis is divided into 11 districts that elect 55 members of the London School Board, which has charge of public instruction. The Metropolitan Asylums Board has charge of all the asylums for imbeciles, the hospitals for cases of infectious disease, and the training schools for children. The expenditures every year for the relief of the poor, and other assistance provided for by the Poor Law, amount to more than $15,000,000. The annual cost of the entire government of the city is considerably over $65,000,000; the total debt is nearly $230,000,000. The taxes to meet the expenditures are levied over the whole area, in proportion to the population of the various districts. The well-founded complaint that the taxes were disproportionately heavy upon the poorer districts has been met by various expedients to equalize the burden.

HISTORY. When the Romans landed in England they found London already a town of considerable importance. Tacitus wrote that the town was famous for its many merchants and large trade. The Romans, however, did not make London the administrative centre of their British province, though they founded a colony whose buildings extended along the left bank of the Thames from the Tower to the neighborhood of Saint Paul's and north to Finsbury and Moorfield. Alfred the Great in the ninth century made London the capital of his kingdom. One of the first acts of William the Conqueror in England was to begin the erection of the Tower, which was intended as a citadel to overawe the citizens and give him command of the city. The Normans greatly improved the appearance of all the larger towns in the country. Many of them settled in London and erected handsomer buildings than had hitherto been seen in England. The stone buildings, however, were confined to monasteries, churches, and public edifices, all ordinary buildings being still constructed of wood—a fact that promoted the spread of the great fires from which London suffered. The wooden London Bridge was torn down in 1176 and rebuilt with stone, there being twenty arches and a drawbridge. This structure, completed in 1209, repaired and tinkered from time to time, was in service till early in the last century, when it gave place to the present bridge. The wealth, grandeur, beauty, and magnificence of the London of the early part of the Plantagenet period is frequently referred to by the writers of that day; but there seems to be satisfactory proof that in 1377 the city had a population of less than 35,000. Throughout the Middle Ages the progress of London was slow, and was repeatedly arrested by wars, commercial crises, and epidemics. London naturally has always shared both the prosperity and the reverses of England. The fact that most of the area now in the heart of the city was in a wild and uncultivated state as late as the time of Henry VIII. is shown by his edict for the protection of game-birds in the region from his palace "at Westminster to Saint Giles-in-the-Fields, from thence to Islington, Hampstead, and Hornsey Park." The monasteries and other religious houses founded by the Normans were converted by Henry VIII. into hospitals (including Saint Bartholomew's Hospital), or the rents were applied to charitable purposes. The sixteenth century witnessed a great expansion of British trade, and as transoceanic lands were brought within the sphere of European commerce a great impetus was given to the progress of London.

The opening by Queen Elizabeth of the Royal Exchange was one of the events marking London's growth in world importance. The city was extended in all directions during her long reign. Fearing that it might become too great and powerful, the Queen issued in 1580 her famous proclamation prohibiting the erection of any new buildings for three miles outside of the city gates. It was impossible, however, to fix, by decree, the limits of inevitable expansion, and the growth of the city was scarcely checked even by the frightful calamities, the political turmoil, and the civil wars that marked the era of the Stuarts. London had at various times been sorely stricken with pestilence, but in the infliction that passed into history as 'the Great Plague' her sufferings from outbreaks of infectious disease reached their climax. In 1665 about 100,000 Londoners died in six months of the plague that broke out in the crowded streets; and the plague was followed the next year by a fire which began in the heart of the city and laid London in ashes from the Tower to the Temple. The loss in buildings and merchandise "was beyond count. Thirteen hundred houses and nineteen churches were destroyed." Prostrate as London was, the fire was not an unmixed calamity. The London built of wood had vanished to give place to a city of brick and mortar, with wider streets and more open spaces. It was due to the fire that so little of London previous to the seventeenth century has been preserved. Most conspicuous features in the rebuilding of London were the Cathedral of Saint Paul's, and many lesser churches which covered the name of Wren with renown.

At the beginning of the eighteenth century Paris equaled London in population, and no doubt surpassed it at some earlier periods. The eighteenth century was most important in the development of London. The footing which England gained in India gave London a fresh source of wealth through its rich commerce with the Orient; it was then that the city forged permanently ahead of Paris in number of inhabitants. The population, scarcely over 500,000 souls at the beginning of that century, increased to nearly 1,000,000 in one hundred years. Building operations, with the increase of wealth, extended greatly in the West End; but what is now the north of London was almost wholly neglected, and, in fact, building was not extended in this quarter to a large extent till water was conveyed thither in pipes, because the underlying rocks do not retain the rainfall. Many of the streets were still in a wretched condition, and it was left for the nineteenth century to begin to widen and improve them. That century witnessed the taking in of a large number of suburbs on all sides, the first lighting of the streets with gas on the King's birthday (June 4, 1807), the rebuilding in stone of all the London bridges, and the infusion of a higher degree of taste in building operations generally, so that the streets are now diversified by some pleasing architecture, though the buildings on the whole are monotonously ugly. For the first time tradesmen began to make their homes in the suburbs or away from their places of business, so that one of the most impressive features of London life to-day is the rush of vast multitudes every week-day morning to business and the mighty ebb of these streams of humanity from the scenes of trade and finance at the close of the day. Steam-power applied to machinery made London an industrial centre which, though surpassed by many other cities in single branches of manufactures, forms on the whole the largest aggregate of industrial activity in the world.

Bibliography. A library of books has been written about London, and the works mentioned here were published in the metropolis. Some of the earlier books are extremely valuable for historic reasons. Such are Fitzstephen's work, written in the reign of Henry II., but first printed in Stow's *Survey* (1598); Arnold's *Chronicle of the Customs of London* (1502); Stow's *Survey* (1598), continued by various writers, and finally by J. Strype, the last edition of whose work (1755) is the standard history of London up to that date. E. Hatton's *New View of London* (1708) contains an alphabetical list of the streets. The fourth edition of Pennant's *London*, a very popular book, was printed in 1814. Allen's *History and Antiquities of London, Westminster, and Southwark* (1827-29) is a very valuable work, containing much information not found elsewhere. *London*, edited by Charles Knight (1841-44), and later revised by Walford, is not exhaustive, though parts of it are especially well treated. The *Book of British Topography*, by J. P. Anderson (1880), contains a bibliography of London, not exhaustive, but fuller than any other. Among the more prominent recent books is Loftie's *London City, Its History, Streets, Traffic, Buildings, and People* (1891); Peter Cunningham's invaluable *Handbook of London* (1850) was brought up to date in Wheatley's *London, Past and Present* (3 vols., 1891); Hare's *Walks in London* (2 vols., 1878) is replete with anecdote, historical association, and charming description; Herbert Fry's *London in 1899* and Besant's *London* (1902) are two of the latest considerable works. Baedeker's volume devoted to London contains very excellent and helpful maps, an enormous amount of accurate information, and is kept up to date by frequent revisions. The condition and economic aspects of the laboring classes is exhaustively treated in Booth's *Life and Labor of the People in London* (4 vols., 1892). Various annual Government reports give valuable and detailed information as to the sociological, educational, governmental, and other conditions of the city.

LONDON. A city and port of entry, the capital of Middlesex County, Ontario, Canada, 121 miles west of Toronto; on the Grand Trunk, the Canadian Pacific, and the Lake Erie and Detroit railroads (Map: Ontario, B 5). The city has gas and electric lights, Anglican and Roman Catholic cathedrals, a mechanics' institute, libraries, hospitals, orphan asylum, convent, and exposition building. The Western University, Huron College, Hellmuth College, Hellmuth Ladies' College, and a mercantile college are the chief educational institutions. The fitness of its situation for a town was recognized by General Simcoe as early as 1784. The site began to be cleared and the place laid out in 1826. The centre of a rich agricultural district, London carries on a large trade in the produce of the country, and there are foundries and machine-shops, mills, chemical works, boot and shoe factories, tanneries, and outside the city large petroleum refineries. In the vicinity are white sulphur springs much resorted to by invalids. London is the seat of a United States consul. The population, in 1851, was 6034; in 1891, 31,977; in 1901, 37,983.

LONDON. A village and the county-seat of Madison County, Ohio, 25 miles west by south of Columbus; on the Cleveland, Cincinnati, Chicago and Saint Louis Railroad (Map: Ohio, D 6). It is the commercial centre for a productive agricultural and live-stock district, and has some manufactures. The electric-light plant is owned and operated by the municipality. Population, in 1890, 3313; in 1900, 3511.

LONDON, Conference of. The name of several diplomatic meetings held in London. The first to be so designated resulted in July, 1827, in a treaty signed by England, Russia, and France to bring about the liberation of Greece from Turkey. The next, held by the Great Powers in 1830-31, recognized the independence of Belgium, and arranged the terms of its separation from Holland. A third conference was held in 1840, on the Turko-Egyptian question, in which France refused to take part. (See Mehemet Ali.) On August 2, 1850, a protocol was signed in London by the representatives of all the Great Powers, declaring the indivisibility of the Danish monarchy, inclusive of Schleswig and Holstein. (See Schleswig-Holstein.) This was followed by the London Protocol of May 8, 1852, respecting the succession in the Danish dominions. In May, 1867, a conference was held in London which resulted in the neutralization of the Duchy of Luxemburg.

LONDON BRIDGE. The most important bridge of London, connecting the City with the Borough. It stands about half a mile above the Tower, and until the opening of Tower Bridge in 1894 was the nearest of the London bridges to the sea. The first stone bridge at this point was completed in 1209, and was built up with rows of houses, forming a street which later became the centre for booksellers and other tradesmen. On it stood a chapel of Saint Thomas of Canterbury, and a tower on which the heads of traitors were exposed to view. The present bridge, about 100 feet farther up the river, was designed by John Rennie and built by his sons in 1825-31. It is borne on five granite arches, and is 928 feet in length, 54 in width, and 56 feet above the river. The daily traffic is estimated at upward of 100,000 foot passengers and 20,000 vehicles.

LONDON CLAY. A term applied to a series of strata of Lower Eocene age, occupying the lower basin of the Thames in England. Its total thickness is about 700 feet. The strata are represented in the Hampshire Basin by the Bognor Beds.

LONDON COMPANY. A branch of a joint-stock company, founded in London in 1606 for the purpose of planting two colonies in America. The two branches of the organization were called from their headquarters the London or Virginia, and the Plymouth or North Virginia companies. To the London company was assigned the territory between 34° and 38° N. latitude, to the Plymouth Company that between 41° and 45°, while the region between 41° and 38° was to be under the control of the company which should found the first colony. The first expedition, under Newport, sailed on December 19, 1606, with three ships and 105 emigrants, of whom only 12 were laborers, and on May 23, 1607, founded the settlement of Jamestown.

LONDONDERRY, lŭn′don-dĕr′rĭ. A maritime county of the Province of Ulster, Ireland, bounded north by the Atlantic, east by County Antrim and in part by Lough Neagh, south by Tyrone, and west by Donegal. Area, 816 square miles (Map: Ireland, E 2). The surface of Londonderry is irregular. The lowlands are fertile and produce good crops. Poultry farming is a profitable industry. The river Bann is celebrated for its salmon fisheries, besides being a great source of motive power for the staple manufacture of Ulster, that of linen. The capital is Londonderry. Population, in 1841, 222,460; in 1901, 144,330.

LONDONDERRY, or DERRY. A city, seaport, and a corporate and Parliamentary borough, capital of Londonderry County, Ireland, on the Foyle, 3 miles from its entrance into Lough Foyle, and 144 miles north-northwest of Dublin (Map: Ireland, D 1). It is beautifully situated on the left bank of the Foyle, upon a hill which overlooks the river. The walls are still preserved, and form an agreeable promenade; they surround a part of the town one mile in circumference, but the buildings have extended beyond. A square from which the four main streets diverge is called the Diamond. The left bank of the river is connected by an iron bridge, 1200 feet in length, with an extensive suburb called Waterside. The Anglican cathedral dates from 1633, and there is a handsome modern Catholic cathedral. The court-house is a building of some pretensions, and the famous siege of 1689 is commemorated by a triumphal arch and by a column in honor of the Rev. George Walker, who was Governor of the city during the memorable defense. Among the educational institutions are Gwyn's School and Magee College. The chief industries are distilling, brewing, tanning, the manufacture of shirts and table-linen, and extensive salmon-fishing. The arrangements and appliances of the port are on a good scale. Steamers ply to Liverpool, Glasgow, and Belfast, and there is a large import trade in maize, wheat, petroleum, timber, flaxseed, etc. The United States is represented by an agent. The town originated in a monastery founded in the sixth century by Saint Columba. It was pillaged more than once by the Danes, and was occupied, but with many vicissitudes, by the English at the invasion. The town formed part of the escheated territory granted to the London companies, and under their management it rose to some importance, and was strongly fortified. In the Irish War of the Revolution, Londonderry threw itself earnestly into the cause of William of Orange, and closed its gates against James II. The siege of Londonderry in 1689 is one of the most celebrated events in Irish history. Since that date the city has steadily grown in extent and prosperity. Population, in 1851, 19,888; in 1891, 33,200; in 1901, 39,873. Consult Hempton, *Siege and History of Londonderry* (Londonderry, 1861).

LONDONDERRY, second Marquis of. A famous English statesman, better known as Viscount Castlereagh. See STEWART, ROBERT, second Marquis of Londonderry.

LONDONDERRY, CHARLES WILLIAM STEWART VANE, third Marquis of (1778-1854). An English soldier and statesman. He was distinguished both as a soldier and diplomatist in the English service in the period of the French revolutionary wars and of Napoleon, and was a member of the Congress of Vienna. His surname of Vane was added on his marriage with a great heiress of that name, and in 1843 he became a colonel in the Life Guards. He wrote *A Narrative of the Peninsular War* (1828) and a *Narrative of the War in Germany and France in 1813-14* (1830), and edited the correspondence of his brother, Viscount Castlereagh.

LONDON PHILHARMONIC SOCIETY. See PHILHARMONIC SOCIETIES.

LONDON ROCKET. A cruciferous weed. See HEDGE-MUSTARD.

LONDON STONE. An ancient relic imbedded in the walls of Saint Swithin's Church in London, and believed to be a fragment of the central milestone from which distances were measured. The stone is said to have come from Troy and to have been the palladium of the settlement. References to it as a very ancient landmark are found in early records.

LONDON UNIVERSITY. London University was founded in 1827 as a joint-stock company by subscription, largely owing to Lord Brougham. It was opened in 1828, with classes in the faculties of arts, law, and medicine, and the incorporators endeavored to obtain from the Crown a charter giving them the power to confer degrees. In 1833 the Privy Council proposed a scheme of a university which, adopted by Lord Melbourne's Government, became the basis of the present institution. It comprised the granting of a charter to 'London University College' or other colleges of the same kind, the granting of another charter to a board of examiners, composed of persons eminent in literature and science, to be called the 'University of London,' and the admission of properly certified pupils of University College and King's College, or of any other school named by the Crown, to examination for the degrees. This scheme was adopted by the incorporators, and charters were granted by William IV., November 28, 1836, constituting the University of London and University College, the former an examining, the latter an instructing body. King's College (q.v.), incorporated in 1829 by charter, and several colleges in London and elsewhere were named as places where students were entitled to present themselves for degrees. The charter of the university was renewed at the accession of Victoria, and a supplementary charter affiliating additional colleges was issued in 1850. In 1858 a new charter gave graduates rights as part of the corporate body of the university in an assembly called convocation. By this charter, too, the university degrees were given solely by examination, it having been found that many affiliated colleges abused the certification privileges granted them. Since that time the university has confined itself strictly to the business of examination, with the single exception of requiring attendance for medical degrees. In 1863 the university was empowered to grant the degrees of B.Ch. and M.Ch. in surgery.

By the supplementary charter of 1867 examinations for women were instituted, and by virtue of the Reform Act of that year the university has since returned one member to Parliament. In 1878 the university admitted women to degrees. By virtue of the University of London Act of 1898, a royal commission was appointed to reorganize the university completely, while still preserving its corporate continuity. In the years 1900-01 this work was completed and the new corporation, coördinating and controlling the higher education of London into a *universitas litterarum*, began its labors. This new university comprises, in addition to its examining functions, a considerable number of schools previously more or less independent as teaching bodies. Of these, University College and King's College possess general faculties, six are theological schools, four are faculties of arts and sciences, ten are medical colleges, and others include technological and agricultural institutions and the newly established London School of Economics and Political Science.

The senate is the supreme governing body of the university. It consists of fifty-four members. The officials of the university are a chancellor, a vice-chancellor, a chairman of convocation, a principal, and a representative in Parliament. The senate has three standing committees of prime importance—the academic council, the council for external students, and a board to promote university extension. The convocation of the university consists of the chancellor, the vice-chancellor, the members of the three committees of the senate who are not graduates, and the graduates of the university. There are the following faculties: divinity, arts, laws, medicine, music, science (which includes the faculties of economics and engineering), each choosing its own dean. There are, further, thirty-two boards of studies, named by the senate, and a large body of examiners chosen by that same body. The university will not, as was first planned, become a teaching body save in so far as the various teaching bodies incorporated with it are under its supervision, and, to some extent, its control, and in so far as its attention to secondary education and its work in university extension may be so regarded. It retains its private function of an examining board granting degrees. Degrees are granted purely by examination (save in the case of medicine) as follows: In arts and medicine, bachelors' and masters' degrees are given; in science, law, and music, bachelors' and doctors' degrees; and in literature, the doctors' degree. Examinations are given in London, in the provinces, and even in the colonies. All graduates are entitled to a teachers' diploma. Consult *London University Calendar* for history and organization. For English legal education, see INNS OF COURT; LEGAL EDUCATION. See also UNIVERSITY, section *English Universities*.

LONDON WALL. The Roman wall built in the fourth century by Constantine, inclosing the Roman colony of London. Its western end was at the site of the present Tower, whence it followed the line of the Minories, Houndsditch, and the street now called London Wall, to Aldersgate Street, and southward by Newgate to Ludgate to the Thames, which it reached in the neighborhood of Blackfriars Bridge. In recent times the wall has almost entirely disappeared, but portions may be seen in London Wall and in the Churchyard of Saint Giles, Cripplegate. The gates in the Roman wall afterwards received names which are perpetuated in the names of streets which passed through them, as Newgate, Bishopsgate, Moorgate, etc.

LONE WOLF. (1) A noted Kiowa chief, 1866-1879, and leader of the hostile element in the last outbreak in 1874. His name in his native language, *Gui-pägo*, was hereditary in his family. He succeeded to the head chieftainship in 1866, but was not among the signers of the Medicine Lodge Treaty the following year, by which the Kiowa agreed to come upon a reservation, and it was not until Custer, who had secured possession of him and Satanta after the battle of the Washita, threatened to hang them both that they consented to bring in their people in the spring of 1869. The several tribes party to the treaty continued restless, however, Lone Wolf himself being one of the most defiant, until a delegation, headed by him, was made up and proceeded to Washington in 1872 to adjust their differences. Some good result might have been effected, but, unfortunately, shortly after the return of the delegation Lone Wolf's favorite son and nephew were killed while raiding into Mexico. On this he swore vengeance, and, going down into Mexico with a small party, brought back the bones of his son for burial, returning just in time to head the war element of the Kiowa in the outbreak of the Southern tribes in the summer of 1874. His first encounter with the troops occurred at the agency at Anadarko, August 22d.

From that time the campaign was pressed vigorously under General Mackenzie until the spring of 1875, when, one after another, the hostile chiefs, including Lone Wolf, came in and surrendered. Seventy warriors, including Lone Wolf and twenty-five other Kiowa, were selected for deportation to Florida, where they were held as prisoners at Fort Marion until May, 1878, when the survivors were returned to their tribes. He died the next year, having previously conferred his name and succession upon the present chief of that name.

(2) The adopted son and successor of the great Lone Wolf. He had been the close companion of the chief's son, killed in Mexico, in consequence of which Lone Wolf adopted him to fill the vacant place, and afterwards appointed him his successor by giving him his own name. In 1892 he signed the treaty for the sale of the Kiowa Reservation, in spite of the remonstrance of the majority of his tribe, but afterwards repudiated the document on the ground of deception.

LONG, Crawford W. (1815-78). An American surgeon, probably the first to use ether anæsthesia in surgery. He was born in Danielsville, Ga., was graduated from Franklin College, Pennsylvania, in 1835, and from the medical department of the University of Pennsylvania in 1839. Having learned from a pupil, Wiltshire, of the insensibility produced in apothecaries' clerks by inhaling ether vapor for amusement, Long experimented upon himself, and in March, 1842, administered ether to James Venable, and during the patient's unconsciousness excised a tumor from his neck. In the same year and in 1845 Long operated upon three other patients, under ether, but did not report his cases or publish his observations. The knowledge of his operations did not spread beyond his own locality. In 1846, while Long hesitated, Morton, at Jackson's suggestion, made his first public demonstrations and published his repeated successes to the world. In 1902 the Georgia Medical Association began to collect funds with which to erect a statue of Long in the Capitol at Washington, as 'the discoverer of anæsthesia.' See Anæsthetic; Morton, W. T. G.; and Wells, Horace. Consult Paget, "Anæsthetics: the History of a Discovery," in *Nineteenth Century* (December, 1879).

LONG, George (1800-79). A distinguished English classical scholar. He was born at Poulton, in Lancashire, England, and was educated at Trinity College, Cambridge, where he obtained the Craven scholarship in 1821. Long became chancellor's medalist in 1822, and subsequently fellow of his college. In 1824 he accepted the professorship of ancient languages in the University of Virginia, but returned to England in 1826, to become professor of the Greek language and literature in the London University. This office he resigned in 1831, when he commenced to edit the *Journal of Education*, published by the Society for the Diffusion of Useful Knowledge; but probably the greatest labor of his life was his editing for eleven years (from 1832 to 1843) the *Penny Cyclopædia*, to which he was also one of the most valuable contributors. In the midst of these arduous duties, Long joined the Inner Temple, and was called to the bar in 1837. In 1846 he was chosen by the benchers of the Middle Temple to deliver a three years' course of lectures on jurisprudence and civil law. In 1849 he became professor of classical literature in the Proprietary College at Brighton, which appointment he held till 1871. Long was one of the best classical editors that England has produced; he was also one of the first authorities on Roman law. His merits as a translator are no less great, as evinced in his *Selections from Plutarch's Lives, Thoughts of Marcus Aurelius* and his *Discourses of Epictetus*. Long also contributed to Smith's Classical Dictionaries; edited Cicero's *Orations* and Cæsar's *Gallic War;* and published an *Analysis of Herodotus, France and Its Revolutions*, etc. In 1873 he received a life pension of £100. He died August 10, 1879.

LONG, John Davis (1838—). An American political leader and lawyer, born at Buckfield, Oxford County, Maine. He graduated at Harvard in 1857, studied at the Harvard Law School, and in 1861 was admitted to the bar. From 1875 to 1878 he was a member of the Massachusetts Legislature, and was Speaker in 1876-78. In 1879 he was elected Lieutenant-Governor, and from 1880 to 1882 was Governor. He served as a member of Congress from 1883 to 1889, and in 1897 was appointed Secretary of the Navy by President McKinley. During the trying period of the Spanish-American War his administration of this department was exceedingly able. He published an excellent blank-verse translation of the *Æneid* (1879).

LONG, Stephen Harriman (1784-1864). An American engineer and explorer, born at Hopkinton, N. H. After graduation at Dartmouth in 1809 he became a teacher. In 1814 he was appointed second lieutenant, U. S. A., in the Corps of Engineers, from 1814 to 1816 was assistant professor of mathematics at the United States Military Academy, and in 1816 was brevetted major. In the latter year he made under great difficulties a survey of the Mississippi and its branches, and soon after led an expedition from the Mississippi to the Rocky Mountains, one of the noblest peaks of which bears his name. He was concerned in the construction of many of the principal railways of the South and West, was the first to suggest the application of the rectangular trussed frame to bridges, and was extensively employed in the improvement of rivers and harbors. In 1861 he was appointed chief of topographical engineers with rank of colonel, and in 1863 retired from the army. His *Railroad Manual* (1829) was the first original work of the sort published in the United States. Consult Keating, *Narrative of an Expedition to the Source of Saint Peter's River, Lake Winnepeck, Lake of the Woods, etc., Performed in the Year 1823* (London, 1825).

LONG'ACRE, James Barton (1794-1869). An American engraver, born in Delaware County, Pa. He served an apprenticeship in Philadelphia and was afterwards for many years engaged in illustrating important American works. He prepared (for a time with James Herring) the *National Portrait Gallery of Distinguished Americans* (3 vols., 1834-39), many of the engravings in which were made from his own sketches. In 1844 he was appointed engraver of the United States Mint, a post he retained until his death. All new United States coins struck during that time were from his designs.

LONGAN, lŏŋ′gan (Neo-Lat. *longanum*, from Chin. *lung yen*, dragon's eye), *Nephelium longana*. An evergreen tree and its fruit, which is smaller than and inferior to its close relative the litchi (q.v.). The tree which produces it is a native of Southeastern Asia and is generally cultivated in China and other Eastern countries.

LONG BOAT. A term not now much used, but formerly applied to the largest boat carried by a merchant vessel and answered to the sailing launch or pinnace of a man-of-war. It was used in transporting heavy cargo when boats from shore were not to be had, and in making long trips over rough or open water unsuited to boats of less size. It was fitted with masts, sails, and oars, and in the event of shipwreck was usually large enough to contain all or nearly all of the officers and crew. It was too large to be carried at ordinary davits, and was hoisted in amidships and stowed on deck.

LONG BRANCH. A town in Monmouth County, N. J., 30 miles in a direct line and 45 miles by rail south of New York City; on the Atlantic Ocean, on a branch of the South Shrewsbury River, and on the Pennsylvania, the Central of New Jersey, and the New Jersey Southern railroads (Map: New Jersey, E 3). During the summer months steamboats also ply regularly to New York, and electric roads connect with places near by, running through a picturesque district. Before the Revolution the land in the vicinity of Long Branch, which was settled about 1670, was owned by a British officer, Colonel White, who passed his summers here. In 1788 several families from Philadelphia began coming for a part of each summer, and in 1790 the place was improved and exploited as a summer resort, soon becoming exceedingly popular. The great hotels, large boarding-houses, picturesque cottages, and numerous bathing-houses afford accommodation for thousands of people during the heated season. The bluff overlooking the sea, along which extends the grand Ocean Avenue, has suffered severely from the action of the ocean, notwithstanding the protection afforded by a system of massive bulkheads. There are a free reading-room and circulating library, and the Monmouth Memorial Hospital. The government is administered under a charter of 1875, by a board of seven commissioners, annually elected, four by wards and three at large, who choose the Mayor from among their number. The majority of subordinate officials are chosen by the board. Population, in 1890, 7231; in 1900, 8872.

LONG BRIDGE. A bridge over the Potomac River, connecting Washington with the Virginia shore. During the Civil War it was the chief line of communication with the Army of the Potomac and was strongly fortified.

LONGCHAMP, lôɴ′shäɴ′, William de (?-1197). Bishop of Ely and Chancellor of England. He was a deformed Norman of low birth, who had won the confidence of Richard before he ascended the throne, and was made by him Chancellor and Bishop of Ely (1190). When the King left England in 1190 he appointed Hugh of Durham and Longchamp joint justiciars and a year afterwards Longchamp was made Papal legate. He quarreled with Hugh and afterwards with John Lackland, and made himself very unpopular in England by his taxations and haughty disregard of the wishes of the people. Many of the nobles supported John, and Longchamp was finally obliged to leave the country. He joined Richard, who was imprisoned in Germany, and by him was placed in charge of the collection of the ransom and hostages demanded by the Emperor. When the King returned to England in 1194 Longchamp was reinstated as Chancellor. He died at Poitiers on his way to Rome as envoy to the Pope. Despite the universal dislike of him in England, Longchamp was an able ruler and always remained devoted to Richard's interests. Consult Boivin-Champeaux, *Notice sur Guillaume de Longchamp* (Evreux, 1885).

LONGCHAMPS, lôɴ′shäɴ′. A part of the Bois de Boulogne, the site of an abbey founded in 1260 by Isabel, sister of Saint Louis, and increased and enriched by successive kings. By the sixteenth century the early rigor of the Franciscan nuns who occupied the convent had degenerated into disorder and license, and Longchamps became a home for nuns of high family who cherished a love for the world within the precincts of the cloister. The abbey became a favorite resort for the *beau-monde* of Paris, who went there during Holy Week to hear the Tenebræ sung by ladies from the opera. Archbishop Beaumont, just before the Revolution, caused the churches to be closed; the abbey was suppressed in 1792. But people, nevertheless, continued to drive to Longchamps for pleasure, and at the present day it is the favorite promenade of the Parisians, and the site of their finest race-track.

LONG-CRESTED JAY. See Jay.

LONGE. A local name in New England for the lake-trout. See Namaycush.

LONG-EARED OWL. See Owl.

LONG EATON. A town in Derbyshire, England, seven miles southwest of Nottingham (Map: England, E 4), noted for its lace manufactures. Population, in 1891, 9600; in 1901, 13,000.

LONGEVITY (Lat. *longævitas*, from *longævus*, aged, from *longus*, long + *ævum*, age). The length or duration of life in the individual is an uncertain quantity, obviously dependent on manifold environmental circumstances. Each species of plant or animal, as in the case of each individual, has its term of existence, its limit of growth, and the duration of life organisms is extremely variable. The natural life of an ephemera is often spanned by four or five hours; that of the baobab-tree of the Cape de Verde Islands by 5000 years. The duration of life has quite a different meaning from that of the prolongation of life by artificial means or by special care and under peculiarly favorable surroundings.

In plants, annuals (more truly semi-annuals) live but a few months, growing up in spring and dying down, after seeding, in the autumn; biennials die at the end of the second year, while perennials may exist many years. Trees, even of the same order, vary greatly in duration of life; the fir, which is of rapid growth, may decay and die in about 20 years, while the spruce may grow for 150 years. Hufeland states that great age in plants depends (1) on slow growth; (2) it must propagate slowly and late in life; (3) it must have a certain degree of solidity and hardness in its tissues; (4) it must be large and have a considerable extent of surface; and (5) it must rise into the atmosphere. Hildebrand shows that the duration of life in plants is by no means completely fixed and that it may be very considerably changed through the agency of the external conditions of life. He points out the fact that in course of time, and under changed conditions of existence, an annual plant may become perennial, or vice versa. That longevity depends on the environment, especially temperature, is also proved by the fact observed in botany that in certain genera of plants there are species which are annuals in the temperate zone, while other species in the tropics are treelike and live many years.

Great age in animals is by no means confined to the higher vertebrates. A specimen of sea-anemone (*Actinia mesembryanthemum*) lived in an aquarium in Edinburgh from 1828 to August 4, 1887. In the Roman fish-ponds lampreys were reputed to have reached their sixtieth year. The crocodile lives a century and continues to grow till it dies; pike and carp are said to have lived 150 years; eagles, falcons, and crows a century. A white-headed vulture in the Schönbrunn Zoölogical Gardens is known to have been in captivity for 118 years. The smallest singing birds live ten years, while the nightingale and blackbird survive twelve to eighteen years. It is supposed that eider ducks may reach the age of nearly a century. Of mammals, only man, the elephant, and the whale live to be a hundred years old. The horse and bear rarely reach an age of 40 years, the lion 35, the wild boar 25, the sheep 15, the hare 10, and the squirrel and mouse 6 years. As Weisman states, the minimum duration of life necessary for the species is much lower than among birds.

Of crustacea, the crayfish is said to live 20 years; the queen of the honey-bee lives one or two years, but has been kept for five, while Lubbock kept one female ant over thirteen years and another nearly fifteen years, which continued to lay fertile eggs throughout her life.

The initial and most fundamental cause of longevity in plants is the favorable nature of the environment, the external conditions of life, particularly temperature. It is most probable that this profoundly affects the duration of life in animals. See GROWTH; METABOLISM.

Another factor is heredity. It is well known that longevity runs in families, is hereditary, and that, although individuals who attain a great age may be exposed to the same exigencies of life as those who die young or in middle life, they outlive their generation. The longevity of man is usually given as 100 years, but there are many authentic instances of people reaching 108 years. Beyond that limit, however, cases are very rare. The great majority of long-lived individuals have been of medium height and weight, of quiet, regular habits, moderate eaters and temperate drinkers or abstainers. Tobacco seems to play but small part. Women live longer than men, probably because after the child-bearing period they are less exposed to injury and disease than men. See LIFE, MEAN DURATION OF.

That the average length of human life has been nearly doubled within a few centuries is due to improved conditions of living, to the progress of civilization, and especially to improved sanitary conditions. Thus the mean duration of human life in France at the close of the eighteenth century was 29 years; in the period from 1817 to 1831 the average rose to 39 years, and between 1840 and 1859 to 40 years. For England it has been from 39 to 43. For Massachusetts the average is about 40, and in New York City 33.3. The mean normal longevity may not be the same in all races. The negroes of Senegal develop earlier than the white man, but they are shorter-lived. Yet when reared in the United States they live to a great age. This is another proof of the profound influence of the mode and general conditions of life on longevity.

There is also a close correspondence between the duration of life in the individual and that of the species. Most specific forms are comparatively short-lived. They have originated, flourished, and died out within the limits of a geological epoch; while what are called 'persistent' forms, such as Lingulella, Limulus, Ceratodus, etc., have by reason of their great vitality outlived entire faunæ and endured for millions of years, and are now flourishing in apparently undiminished vigor. See EXTINCTION OF SPECIES.

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LONG'FELLOW, HENRY WADSWORTH (1807-82). The most popular of American poets. He was born in Portland, Maine, February 27, 1807, and was the second son of Stephen Longfellow, a well-to-do lawyer of Portland, and Zilpah Wadsworth. Through his mother's family Longfellow was descended from John Alden and Priscilla Mullens, whom he made famous in his poem "The Courtship of Miles Standish." He early showed a liking for literature. As early as 1820 he had printed verses in the Portland *Gazette.* In 1825 he was graduated in the same class with Hawthorne from Bowdoin College, Brunswick, Maine, after a course marked by studiousness and quiet. He was immediately made professor of modern languages at Bowdoin, but was allowed to go to Europe for three years, to fit himself for his profession. In Europe, from 1826 to 1829, his life was passed in hard study in Paris, and in Italy and Spain. He was married in 1831 to Miss Mary Storer Potter, who died in 1835. Aside from a collection of juvenile poems, in 1826, and his translation of a French grammar for use in his classes, in 1830, his first literary work was the translation of the *Coplas de Manrique* (1833). The same year he published the first part of *Outre-Mer: A Pilgrimage Beyond the Sea,* and the second part the following year (in book form, 1835), both rather stilted sketches of travel. In 1835 he resigned his chair at Bowdoin, and went again to Europe for a year's study, in preparation for the Smith professorship of modern languages at Harvard, which had been held by George Ticknor, the historian of Spanish literature. From 1836 his residence was in Cambridge, where he first occupied and afterwards owned the Craigie House, the headquarters of Washington during the operations about Boston in the War of Independence.

In 1838 his well-known "Psalm of Life" appeared in the *Knickerbocker Magazine*, and the following year was published, with other poems, in *Voices of the Night*. The same year appeared *Hyperion*, a rather florid romance, the heroine of which was Miss Frances Appleton, of Boston, whom he married in 1843. In 1841 such poems as "The Wreck of the Hesperus," "The Skeleton in Armor," and "The Village Blacksmith," included in the volume *Ballads and Other Poems*, confirmed his literary reputation, and made him perhaps the most widely read of American poets. In 1842 he again went to England, and the same year published *Poems on Slavery*. It is sufficient to indicate the chief titles of his prolific later work: *The Spanish Student* (1843), a drama of no great merit; *The Belfry of Bruges, and Other Poems* (1846); *Evangeline: A Tale of Acadie* (1847), a very popular narrative pastoral in hexameter verse; *Kavanagh* (1849), a romance of better quality than *Hyperion; The Seaside and the Fireside* (1850), a volume of poems which included "The Building of the Ship;" *The Golden Legend* (1851); *The Song of Hiawatha* (1855); *The Courtship of Miles Standish* (1858), a narrative poem in hexameters; *Birds of Passage* (1858); *Tales of a Wayside Inn* (1863), a volume of narrative poems modeled on the *Canterbury Tales; Flower-de-Luce and Other Poems* (1867); a translation of the *Divine Comedy* of Dante, in verse (1867-70); *New England Tragedies* (1868), two dramas dealing with historical events of early New England; *The Divine Tragedy* (1871); *Three Books of Song* (1872); *Aftermath* (1873); *The Hanging of the Crane* (1874); *The Masque of Pandora* (1875); *Kéramos and Other Poems* (1878); *Ultima Thule* (1880); *In the Harbor* (1882); and *Michael Angelo*, the fragment of a drama (1883). He also edited an anthology, the *Poets and Poetry of Europe* (1843), and *Poems of Places* (1876-79, in 31 vols.). During this time his private life had been uneventful, except for the death of his wife, through burning, in 1861. In 1854 he resigned his professorship at Harvard, and thenceforward lived quietly in Cambridge until his death, on March 24, 1882.

In appearance, Longfellow was of medium stature, and had rather pronounced, heavy features, cast in a mold of benignity. Kindliness was one of the chief traits of his character. As a teacher and writer he was always conscientious and industrious. He numbered among his personal friends the most famous writers and statesmen of New England, as Emerson, Hawthorne, Lowell, Holmes, Whittier, and Sumner.

Poems of Longfellow's such as the "Psalm of Life" and "Excelsior" have gone to the heart of the American public, and ballads such as "The Wreck of the Hesperus," "The Skeleton in Armor," and "The Norman Baron" are on the tongue of many a schoolboy. The secret of his success is that he was essentially a popularizer of ideas. This office manifests itself in two ways: He has given, in the first place, expression to the general and commonplace emotions of American civilization of the better sort, with its simplicity, its plain aspiration, and its lack of subtlety. Such are his poems on slavery, which express the feeling which any humane man might have at the mention of the word, but which lack the fire and deep emotion which a more accurate knowledge stirred in such a poet as Whittier. The "Psalm of Life," "The Building of the Ship," and "The Village Blacksmith" are the phrasing of thoughts dear to the heart of the average man. Akin to these are the large number of poems, of which "Hiawatha," "Evangeline," "The Courtship of Miles Standish," and "Paul Revere's Ride" may be taken as examples, dealing with American life in a quasi-historical and narrative way. Doubtless quite unlike the reality which they are supposed to represent, these poems may be regarded as valuable and popular for the same general reason that made Cooper's novels famous—that they pictured an interesting and previously unknown world.

In the second place, Longfellow did much to open the eyes of Americans to the beauty of European life. He may be said to have done as much as any other American to spread the culture of modern languages in his own land. This he did in verse much more widely than by his actual teaching as Smith professor of modern languages. About half of his verse deals directly with scenes, legends, and stories of European civilization. Longfellow sincerely loved beauty and romance wherever it was to be found, and the pleasant sentiment of such poems as "The Belfry of Bruges" or the narratives of the *Tales of a Wayside Inn* did much to awaken a corresponding glow in the hearts of his countrymen. His service to American scholarship in his translation and annotation of Dante's *Divine Comedy* was great.

Longfellow is justly popular as the poet who has done more than almost any other American to phrase in an artistic and agreeable way the healthy feelings of life. He is surpassed by other Americans in various ways, as by Emerson in profundity and subtlety, by Lowell in vigor and wealth of ideas, by Holmes in wit, by Bryant in stateliness, by Poe in sense of form and beauty; but in general artistic sense, in taste, in kindliness, in morality, he is outstripped by none. He has been called superficial, his poetry academic, his prose rhetorical, but he is certainly one of the most widely diffused forces in the emotional life of Americans. Nor should it be forgotten that in his narrative poems he possesses a freshness and vigor that deserve high praise, and that he is often really inspired when dealing with the sea.

Bibliography. The work of Longfellow is definitively published in the Riverside Edition in 11 vols. (Boston, 1886-90). The chief sources for his biography are the *Life of Henry Wadsworth Longfellow* (Boston, 1886), by his brother, the Rev. Samuel Longfellow, and the same editor's *Final Memorials of Henry Wadsworth Longfellow* (Boston, 1887). These two books were later gathered in three volumes of memoirs. Consult, also: Robertson, in the "Great Writers Series" (London, 1887), and the critical articles in the literary histories, such as Stedman, *The Poets of America* (New York, 1885); Richardson, *American Literature* (New York, 1887-88); and Wendell, *A Literary History of America* (New York, 1900); Carpenter, *Henry Wadsworth Longfellow*, in the "Beacon Biographies" (Boston, 1901); Higginson, *Old Cambridge* (New York, 1889), and a life of Longfellow in "American Men of Letters" (Boston, 1902); Howells, *Literary Friends and Acquaintance* (New York, 1900).

LONGFELLOW, Samuel (1819-92). A Unitarian clergyman and hymn-writer. He was born in Portland, Maine, graduated at Harvard University in 1839, and at Harvard Divinity School in 1846; became pastor of a church in Fall River, Mass., in 1848, and of the Second Unitarian Church in Brooklyn, N. Y., in 1853; resigned the latter pastorate in 1860, and went abroad. On his return to America he fixed his residence at Cambridge, Mass., and continued to preach in Unitarian pulpits, but assumed no pastoral charge till 1878, when he became minister of the Unitarian church in Germantown, Pa. He resigned this pastorate in 1882, and returned to Cambridge. He contributed essays to *The Radical* (1866-71), and published, besides several volumes of hymns and poems, a *Life* of his brother, Henry Wadsworth Longfellow (2 vols., 1886), and *Final Memorials of Henry Wadsworth Longfellow* (1887). Consult his *Memoir* by Joseph May (Boston, 1894).

LONGFIN. A sea-fish of the family Cirrhitidæ and genus Chilodactylus, allied to the sea-breams, and remarkable for a great extension of one of the middle rays of each pectoral fin. Several species are known in the south temperate seas, one of which (*Chilodactylus macropterus*) is an important food-fish both in Australia and at the Cape of Good Hope, specimens sometimes weighing 25 pounds. Other species are the trumpeter-fish and butterfish (qq.v.) of New Zealand.

LONG'FORD. An inland county of the Province of Leinster, Ireland, lying between Leitrim and Cavan on the north, Westmeath on the east and south, and Roscommon on the west; area, 421 square miles (Map: Ireland, D 3). The lands devoted to grazing predominate over arable lands. The industries include the manufacture of woollens and linen. The capital is Longford. Population, in 1841, 115,590; in 1901, 46,600.

LONGFORD. The capital of County Longford, Ireland, 75 miles west-northwest of Dublin, on the Camlin (Map: Ireland, D 3). It is a well-built town, connected with Dublin and Sligo by rail, and also with the former by the Royal Canal. It is the see of the Roman Catholic Bishop of Ardagh and Clonmacnois, and the cathedral is a spacious, magnificent building of the Ionic order. There is also a Roman Catholic college. There are manufactures of brick and some trade in agricultural products. Population, in 1901, 3747.

LONGHENA, lôn-gā'nā, Baldassare (1604-82). The last of the great architects of the late Renaissance in Venice; the artistic successor of Giacopo Sansovino, Andrea Palladio, and Vincenzo Scamozzi. (See articles on these artists.) His long life corresponds with the period known in Italian architectural history by the various names of Baroque, Jesuit, Borrominesque, etc.; a period characterized in general by a great decline in purity of taste and by extravagance, ostentation, and sensationalism in architecture and sculpture and in decorative design generally. Amid this prevalent artistic debasement Longhena maintained the purer traditions bequeathed him by the illustrious succession of great Venetian architects above named. His works are singularly correct and free from sensationalism, considering their period, and yet not without a certain opulence of effect and grandeur of scale. The first of these appears to have been the Palazzo Pesaro (1644-50), in which the style of Giacopo Sansovino, as exemplified in the Libreria di San Marco and the Palazzo Corner de Cà Grande, is frankly followed. To the same date belong the monastic buildings of San Giorgio Maggiore, with a specially fine staircase. The Palazzo Rezzonico, completed in 1686 after his death, is a more sober design of great dignity. His masterpiece was the great domical Church of Santa Maria della Salute (1631).

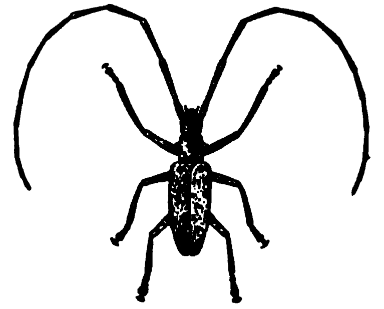
LONGHI, lôn'gê, Alessandro (1726-c.1790). An Italian painter and author, born in Venice. He was the son of Pietro Longhi (1702-62), a Venetian painter, and the pupil of Giuseppe Nogari. He was a portrait painter and engraver, as well as the author of *Compendio delle vite dei famosi pittori veneziani di questo secolo* (1763), with steel engravings after his own plates. When the Venice Academy was founded he was one of the first members.

LONGHI, Giuseppe (1766-1831). An Italian painter and line-engraver. He was born at Monza, in October, 1766, and was a pupil of Vicenzo Vangelisti, a Florentine engraver, and of Giulio Travellesi, a Florentine painter. He also studied at the Brera, Milan, and in Rome, where he came under the influence of Raffaello Morghen. On his return to Milan he gave considerable time to miniature painting. He was elected professor in the Academy of the Brera in 1798, and had many distinguished pupils. Napoleon gave him a commission for an engraving of his portrait by Gros, and a portrait of Michelangelo Buonarotti; also the illustrations for a beautiful work, *Fasti di Napoleone il Grande,* after designs by Appiani. The work was never completed, but there are six fine plates by Longhi. He died at Milan, January 2, 1831. Among his best-known engravings are: "Bonaparte at Arcole," after Gros; "Good Samaritan," "The Philosopher," "Old Man," "Laughing Negro," after Rembrandt; "Saint Joseph Carrying the Infant Jesus," after Guido Reni; "The Beheading of Saint John the Baptist," after Gerard Dou; "Lady Beauharnais and Child," after Sir Thomas Lawrence; "Genius of Music," after Guido Reni, in the Chigi Palace; portraits of Washington, Appiani, Napoleon as King of Italy, and Francis I. of Austria. He wrote a *Life* of Michelangelo (1816), and *Teoria di calcografia* (Milan, 1830). Consult Sacchi, *Biografia di Giuseppi Longhi* (Milan, 1830).

LONGHI, Luca (1507-80). An Italian painter, born at Ravenna. He seems to have been the pupil of Niccolò Rondinelli, and enjoyed a high reputation during his lifetime, though he never worked outside of his native city. His most important painting is the fresco, "The Marriage at Cana" (in the refectory of the old Camaldolensian Convent), which was finished by his son Francesco. Other pictures by him are in the Academy of Fine Arts, and in several of the Ravenna churches.

LONGHORN CATTLE. See Cattle.

LONGICORN, or Long-Horned Beetle. A beetle of the family Cerambycidæ (q.v.), remarkable for its very long antennæ. They are moderate, sometimes of large size, elongated form, and usually bright colors. They are beetles of the forests, and are especially fitted for climbing, especially when larvæ. The fleshy, short-legged grubs bore into wood and feed there, injuring fruit and timber trees.



A LONGICORN.

LONGINUS, lŏn-jī′nŭs. The Latin name sometimes used by the Polish historian Jan Dlugosz (q.v.).

LONGINUS (Lat., from Gk. *Λογγῖνος*), DIONYSIUS CASSIUS (c.213-73 A.D.). A Platonic philosopher and rhetorician. He was born, according to some, at Emesa, in Syria, or, according to others, with more probability, at Athens, about A.D. 213. In his earlier years he traveled a great deal in the company of his parents, and made the acquaintance of many celebrated scholars and philosophers. He studied Greek literature at Alexandria, where he was for a considerable time the pupil of Ammonius, Plotinus, and Origen, and subsequently settled as a teacher of rhetoric in Athens, where he soon acquired a great reputation. His knowledge was immense, but his taste and critical acuteness were no less wonderful. He was probably the best critic of all antiquity. In an age when Platonism was giving place to the semi-Oriental mysticism of Neo-Platonism, Longinus is conspicuous as a genuine disciple of the great master. Clear, calm, rational, yet lofty, he despised the fantastic speculation of Plotinus, who consequently would not admit that Longinus was a philosopher, but—since he stooped to criticise the diction and style of Plato—pronounced him a mere philologist. In the latter years of his life he accepted the invitation of Zenobia to undertake the education of her children at Palmyra; but, becoming also her chief political adviser, he was beheaded as a traitor, by command of the Emperor Aurelian, A.D. 273. Longinus was a heathen, but generous and tolerant. Of the greater part of his works only the barest fragments have survived. A very important and valuable work, entitled *On the Sublime* (Περὶ Ὕψους), was attributed to Longinus by its first editor, Robortello (Basel, 1554), and was accepted as his without question by all subsequent editors until the nineteenth century. The controversy has not been finally settled, but it is believed by many that the treatise belongs rather to the first century A.D. See, for the arguments, Roberts, *Longinus on the Sublime* (Cambridge, 1899), and Saintsbury, *History of Criticism and Literary Taste in Europe*, vol. i. (New York, 1900). The treatise has been edited by Vahlen (Bonn, 1887), and by Roberts, with an English translation in the book above quoted. There is also an English translation by Havell (London, 1890).

LONGINUS, GAIUS CASSIUS. A noted Roman jurist of the first century A.D. He became Governor of Syria in the reign of Claudius, and maintained a high degree of discipline and efficiency in the troops of that province. Subsequently at Rome he aroused by his high position of respect and influence the suspicions of Nero, who banished him to Sardinia. He was recalled thence by Vespasian. His *Libri Juris Civilis*, ten in number, and his commentaries on Uresius Ferox and Vitellius are quoted in the *Digest*, and held high rank among legal works.

LONG ISLAND. An island forming the southeastern extremity of the State of New York, and embracing the four counties of Kings, coextensive with the populous metropolitan borough of Brooklyn (q.v.), Queens, also part of New York City, Nassau, and Suffolk (Map: New York, G 5). It is bounded south and east by the Atlantic Ocean, north by Long Island Sound, and west by New York Bay and the East River. Its length is about 118 miles; its width, 12 to 23 miles; area, 1682 square miles; population, in 1900, 1,452,611, of whom 1,166,582 resided in Brooklyn. The coast is indented with many bays and inlets, and the adjacent waters abound with shell and other fish, constituting a valuable source of food-supply. Peconic Bay, 30 miles long, divides the eastern end of the island into two parts or projections, the one on the northern side terminating at Orient Point, that on the southern terminating at Montauk Point, 20 miles farther east. On the south side of the island, and stretching along nearly half its length, is Great South Bay, from two to five miles broad, formed by Fire Island or Great South Beach, a strip of white sand from one-fourth of a mile to a mile in width, with occasional openings to the ocean. Near the western end of the island are Jamaica, Hempstead, Oyster, and Huntington bays. Shelter, Gardiner, Fishers, and Plum islands, in the adjacent waters, are attached politically to Long Island. The coasts, bordering as they do on the track of an immense ocean commerce, are furnished with a large number of lighthouses, and with life-saving stations, equipped with the most modern appliances for rendering assistance to vessels in distress. The surface, though presenting considerable variety, is marked by no great elevations. A range of glacial hills extends, with frequent interruptions, from the northern boundary of New Utrecht in the west almost to the eastern extremity of the island on the north side of Peconic Bay. These hills are considerably nearer to the northern than to the southern margin of the island. The highest elevations are Hempstead, Harbor Hill at Roslyn, and West Hill in Suffolk County, the last two being 384 feet above the sea. North of the glacial range the surface is uneven and rough, while on the south it gradually slopes toward the sea, and is broken here and there by wide, sandy plains producing only coarse grass and stunted shrubs. Some of these plains, by the application of manures, have been brought under cultivation. A considerable portion of the island is in forest, from which wild game has not yet been wholly exterminated. There are numerous springs and small streams, and many ponds, while swamps and marshes abound. The island is estimated to contain more than 100 square miles of salt marsh. The largest stream is the Peconic, which, after a course of 15 miles, empties into the bay of the same name. It furnishes numerous mill sites.

With the exception of the sandy plains above mentioned the soil is for the most part fertile, in some sections particularly rich. Much of it is in a high state of cultivation. The climate, on account of the influence of the sea, is milder and more equable than at the same latitude in the interior, the mercury seldom falling below zero or rising above 90°, the average temperature being about 51°. Summer bathing and fishing resorts stud the shores, and there are numerous elegant residences and estates, more especially on the bold, hilly, and picturesque northern coast overlooking Long Island Sound. On the south shore the principal places are Manhattan Beach (Coney Island), Rockaway Beach, Far Rockaway, Long Beach, Fire Island, and Montauk Point; on the north shore, College Point, Seacliff, Glen Cove, Oyster Bay, Coldspring Harbor, Northport, Port Jefferson, and Greenport. Finely macadamized roads, the favorite touring grounds of automobilists and cyclists, traverse the island in all directions; the principal railroad is the Long Island, which extends from Long Island City at the western extremity to Greenport and Montauk at the two eastern extremities.

At the time of its discovery by Hudson in 1609, Long Island was occupied by thirteen tribes of the Lenni-Lenape division of Algonquin Indians, who are now represented by a few individuals of mixed blood dwelling near Shinnecock Neck, Forge, and Montauk Point, where at the period of the first European settlement Wyandance, the chief of the thirteen tribes, resided. Antiquarian discoveries have demonstrated the existence of a prehistoric race of different origin. The various Indian names of the island were Sewanhacky, Panmancke, Matouwacks, and Wamponomon. The Dutch named it Lange Eylandt—whence Long Island; a subsequent change by the Colonial Legislature to the Island of Nassau never became popular. Included in the land between the Atlantic and Pacific oceans, embraced by latitudes 40° to 48° North, granted by James I. to the Plymouth Company in 1620, it became the property of the Earl of Stirling, and at his death in 1640 of the Duke of York. The earliest settlements by the Dutch were begun in 1632; the first recorded purchase of land in South Brooklyn is in 1636. The Dutch exercised jurisdiction in the western part of the island down to 1664, in which year they were dispossessed of New Netherland. Many of the agricultural holdings toward the east remain unchanged in the possession of descendants of the original settlers; Gardiner's Island has belonged to the family of that name since 1640. The military operations during the Revolutionary period and the battle of Long Island (q.v.) are the chief incidents of the subsequent history of the island.

Consult: Thompson, *The History of Long Island* (New York, 1843); Prime, *History of Long Island* (New York, 1845); Furman, *Antiquities of Long Island, with Bibliography* (New York, 1875); Flint, *Early Long Island* (New York, 1896); and the *Annual Reports of the Long Island Historical Society* (Brooklyn).

LONG ISLAND, BATTLE OF. A battle fought on Brooklyn Heights, Long Island, N. Y., August 27, 1776, during the Revolutionary War, between a British force of more than 15,000 under General Howe and an American force of about 8000 under the immediate command of General Israel Putnam. The British, landing at a point of Long Island a short distance below the 'Narrows,' marched by three routes against the American position, which had been strongly fortified in anticipation of an attack, Brooklyn Heights being necessary to the British if they were to succeed in their plans for the capture of New York. The most important road, the Jamaica Road, leading to the American position, seems to have been left almost wholly unguarded, and it was by this that the British advanced in greatest force. Parts of the American army under Gen. William Alexander (Lord Stirling) and General Sullivan, stationed in advance of the principal American fortification, were defeated after some stubborn fighting, both Alexander and Sullivan being captured; and Howe then proceeded to invest the works. In the evening of the 27th Washington crossed over to Long Island, and on the following day brought over reinforcements. General Howe showing no disposition to storm, however, Washington decided to abandon the works and transfer his forces to Manhattan Island, and during the night of August 29-30 this was successfully effected, the British not suspecting the movement until the Americans had crossed in safety. The British loss in killed, wounded, and missing in the battle of Long Island was about 400, while the American loss was about 1000. Consult: Field, *Battle of Long Island* (Brooklyn, 1869); Carrington, *Battles of the American Revolution* (New York, 1876); Dawson, *Battles of the United States* (New York, 1858); Johnston, *Campaign of 1776 Around New York and Brooklyn* (Brooklyn, 1878); and the critical article by Adams, "The Battle of Long Island," in *American Historical Review* (New York, 1896).

LONG ISLAND CITY. Formerly a city in Queens County, N. Y. (in the district bordering East River and north of Newtown Creek), now included in the Borough of Queens, New York City (Map: Greater New York, E 6). Long Island City was formed in 1870 by uniting the villages of Blissville, Hunter's Point, Astoria, Ravenswood, Dutch Kills, Steinway, and Middletown under one municipal charter. The first settlement within its limits was made by the Dutch as early as 1640. Consult Kelsey, *History of Long Island City* (Long Island City, 1896).

LONG ISLAND HISTORICAL SOCIETY. An association in Brooklyn, N. Y., organized in 1863 for the purpose of furthering a knowledge of American history, primarily as connected with the history of Long Island. On June 11, 1864, a committee on the natural history of Long Island was appointed, and from its work has grown a fine museum of the flora, fauna, minerals, antiquities, and historical relics of the island. The society has published a number of valuable works, among them two volumes on the Battle of Long Island, and one containing the hitherto unpublished letters of George Washington on agricultural and personal topics. Its library comprises 45,000 volumes and as many pamphlets.

LONG ISLAND SOUND. A narrow arm of the Atlantic Ocean, separating Long Island from the mainland of New York and Connecticut (Map: New York, G 4). It is 110 miles long, and from 20 to 25 miles wide, narrowing at the west into the strait known as East River, separating Manhattan from Brooklyn and Queens boroughs, New York City, and opening into New

York Bay. It opens into the Atlantic by a passage called the Race through a chain of islands running obliquely across from Long Island toward Rhode Island. The Connecticut, Housatonic, Thames, and Mystic rivers flow into Long Island Sound from the north. The Connecticut shore is rocky, skirted by reefs; that of Long Island is more easy of approach, and there are many moderately good and one or two excellent harbors. The narrow and rock-bound passage in the East River known as 'Hell Gate' made this route unavailable for large vessels until the work of removing the rocks was completed by the United States Government in 1885. (See Hell Gate.) The Sound is navigated by numerous coasting steamers and sailing vessels. The entrance to the East River is guarded by Fort Schuyler, on Throgg's Neck.

LONGITUDE. See Latitude and Longitude.

LONGJAW. (1) A name about the Gulf of Mexico for a needlefish of the genus Tylosaurus. (See Aguja; Needlefish.) (2) In the Great Lakes, a whitefish (*Argyrosomus prognathus*), much resembling the cisco, but larger; it is also called 'bloater.'

LONGLEY, lŏng′lĭ, Charles Thomas (1794-1868). Archbishop of Canterbury. He was born in Rochester, England; was educated at Westminster School and Christ Church College, Oxford. He became perpetual curate of Cowley in 1823; rector of West Tytherly, 1827; head-master of Harrow School, 1829; Bishop of Ripon, 1836; of Durham, 1856; Archbishop of York, Privy-Councilor, 1860; and Archbishop of Canterbury, 1862. In 1867 he presided at the sessions of the Lambeth Conference (q.v.). He opposed the Ritualistic movement, and in 1838 suppressed teachings and practices regarded as Roman Catholic in Saint Saviour's Church, Leeds. As a member of the House of Lords, he generally acted with the Liberal Party; but he opposed the Oxford University Reform Bill of 1854, the Divorce Bill of 1857, and motions for the revision of the Prayer-Book, the modification of the Act of Uniformity, and the alteration of the Burial Service. His published works include various addresses and sermons, of which the most important perhaps is the one delivered at the opening of the Conference in 1867; and an English version of Koch's *Tableau des révolutions de l'Europe* (1831). Notices of Archbishop Longley are to be found in Proby, *Annals of the Low Church Party;* Fr. Arnold, *Our Bishops and Deans* (1875); Welch, *Westminster Scholars;* and the *Register of Magazine of Biography* (January, 1869).

LONGLEY, James Wilberforce (1849—). A Canadian journalist and politician, born at Paradise, Annapolis County, N. S., of Loyalist descent. After graduating at Acadia College, Wolfville, he studied law in Halifax and at Osgoode Hall, Toronto; entered at the bar in 1875, and became Queen's Counsel in 1890. He began his newspaper work on the staff of the *Acadian Recorder* (1873), but left it for the Halifax *Morning Chronicle*, of which he was managing editor from 1887 to 1891. He was elected to the local House as member for his native county in 1882, was chosen a commissioner to revise the provincial laws, entered the Executive Council in 1884, and two years later was made Attorney-General. He was instrumental in passing the bill abolishing imprisonment for debt (1890).

LONGMANS. An English family of book publishers, founded by Thomas Longman (1699-1755). He was apprenticed when seventeen years of age to a London bookseller named John Osborn, whose daughter he afterwards married. In 1724 he bought out the business of John Taylor (who published the first edition of *Robinson Crusoe*), and set up for himself on the site which is to-day occupied by the works of his successors. His father-in-law soon joined him, and together they conducted the business until the former's death, when Thomas again became sole director. He was very successful, and was interested in a number of books which were not only good business investments at the time, but which have achieved an enduring reputation, among them David Hume's *Treatise of Human Nature*, and Dr. Johnson's *Dictionary*. He was succeeded by his nephew, Thomas Longman (1730-97), whom he had taken into partnership, and who not only extended the business in England, but carried on a considerable trade with America. The second head of the firm was succeeded on his death by his son, Thomas Norton Longman, who in 1794 received Owen Rees into partnership. During this period the Longmans acquired many valuable copyrights, including Lindley Murray's *English Grammar;* the *Lyrical Ballads* of Coleridge and Wordsworth; Scott's *Lay of the Last Minstrel;* and Moore's *Lalla Rookh*. They also published a number of very profitable encyclopædias, and in 1826 became sole proprietors of the *Edinburgh Review*. Several new partners were admitted during these years, and the title of the firm changed to Longman, Hurst, Rees, Orme, Brown & Green. Thomas Norton was succeeded by his sons, Thomas (1804-79), who became head of the firm on his father's death in 1842, and William (1813-77), who was an author as well as a publisher. His writings dealt chiefly with travel and history, and included a *Journal of Six Weeks' Adventures in Switzerland, Piedmont, and on the Italian Lakes* (1856); *A History of England to the Close of the Reign of Edward II.* (1869); and *A History of the Life and Times of Edward III.* (1869). During this administration the firm published a sumptuous edition of the New Testament, illustrated with wood engravings after paintings by famous artists. It also acquired the copyrights to a number of famous books, including the works of John Stuart Mill and Disraeli's novels, and it published Lord Macaulay's works, giving him as part payment for the third and fourth volumes of his *History of England* a check for £20,000. Thomas Longman was succeeded by his sons, T. N. Longman, who became head of the firm, and G. H. Longman. William Longman was succeeded by his son, James Charles Longman, who graduated at University College, Oxford, and in 1882 became editor of *Longman's Magazine*.

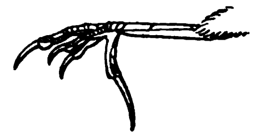
LONG-NECKED TURTLE. A turtle of the genus Chelodina, of which several species inhabit Australia and New Guinea. The neck is as long as the shell, which in the typical species (*Chelodina longicollis*) measures about 10 inches, and is of snake-like appearance and flexibility. A South American genus (Hydromedusa) has an even longer neck in proportion to the shell. The name is sometimes applied to the entire family (*Chelydidæ*) to which these turtles and the quaint matamata belong.

LONGNON, lô′nyôɴ′, AUGUSTE HONORÉ (1844—). A French scholar and historian, born in Paris. He learned the trade of a shoemaker, and practiced it until 1869, when he became a student at the Ecole des Hautes Etudes. He published his *Livre des vassaux du comté de Champagne et de Brie, 1192-1222*, the same year, and the following one received an appointment in the Imperial archives, where he became titular archivist (1871). From 1875 he directed the *Bulletin* of the Historical Society of Paris and Ile de France; in 1879 he became professor at the Ecole des Hautes Etudes, member of the Academy of Inscriptions and Belles-Lettres (1886), of the Legion of Honor (1887), and professor of historical geography at the Collège de France (1892). Besides an edition of Froissart's *Méliador* (1897), Longnon published *Etudes sur les Pagi de la Gaule* (1871-72); *Pouillé du diocèse de Cahors* (1874); *Rôles des fiefs du comté de Champagne sous le règne de Thibaud le Chansonnier* (1877); *Etude biographique sur François Villon* (1877); *Géographie de la Gaule au VIème siècle* (1878), his chief work, which gained the Gobert prize from the Academy of Inscriptions; *Paris pendant la domination anglaise, 1420-1456* (1878); *Documents parisiens sur l'iconographie de Saint-Louis* (1882); *Atlas historique de la France, depuis César jusqu'à nos jours* (1884-89); and *Polyptyque de l'abbaye de Saint-Germain-des-Près* (1886).

LONG PARLIAMENT. The famous fifth Parliament of Charles I., which met November 3, 1640, having been summoned for the purpose of raising supplies to carry on war against his rebellious Scotch subjects. It impeached and executed Strafford (q.v.) and Laud (q.v.), abolished the Star Chamber (q.v.), the High Commission (q.v.), and other arbitrary courts, declared ship-money to be illegal, prohibited the collection of tonnage and poundage without Parliamentary grant, passed a Triennial Act (q.v.), and provided against its dissolution or prorogation without its own consent. The members were unanimous in these constitutional reforms, but they speedily divided into parties upon the question of the reorganization of the English Church, the Cavaliers supporting the King and the bishops. The Irish insurrection of 1641 necessitated the raising of an army, and the dispute as to its control led (1642) to the Civil War, in which the Parliament was successful against the King. In order to secure the support of the Scots, it adopted the Solemn League and Covenant (see COVENANTS), and introduced Presbyterianism (see CREEDS AND CONFESSIONS), the Cavalier members having withdrawn on the outbreak of the war. The army, however, had become the stronghold of the Independents, whom the Parliament was anxious to crush by force. In order to be free to disband the army, Parliament made such concessions to Charles in the Treaty of Newport (1648) as seemed to the army a surrender of the results of the war. The army therefore interfered and expelled by force about ninety-six Presbyterian members, leaving fifty or sixty members, afterwards known as the 'Rump' (q.v.), which executed the King and established the Commonwealth, but was in turn expelled by Cromwell in 1653. During the disorders which followed Cromwell's death, the 'Rump' was recalled for a short time in 1659 and again in December of the same year, to which the expelled Presbyterian members were added on February 21, 1660. The Long Parliament thus restored issued writs for a new election and voted its own dissolution on March 16, 1660. Consult: *Parliamentary History* (36 vols., London, 1806-20); Gardiner, *English History, 1603-42* (10 vols., London and New York, 1883-84); id., *The Great Civil War* (4 vols., London and New York, 1901); Firth, *Cromwell* (London and New York, 1901); Firth, *Oliver Cromwell and the Rule of the Puritans in England* (London and New York, 1900). See CHARLES I.; CROMWELL, OLIVER.

LONG PRIMER. See PRINTING.

LONGSHANKS. A nickname of King Edward I. of England.



FOOT OF LONGSPUR.

LONGSPUR. The longspurs are gregarious, terrestrial finches, having exposed nostrils and the hind claw unusually long and nearly straight, like a spur. Four of these finches occur in the United States, of which three are endemic, while one is circumpolar. This last is the Lapland longspur (*Calcarius Lapponicus*) and breeds only in the highest latitudes; in winter it ranges southward, in America as far as Pennsylvania, Ohio, and Colorado, but is uncommon in the Eastern United States even in severe winters. As usually seen in winter, the upper parts are mixed black, rufous, and buff, the nape yellowish-buff, the under parts white, the breast and sides streaked with blackish and yellowish buff. In the fully plumaged male the head, neck, and breast are black.

The three distinctively American longspurs are easily distinguished from the Lapland longspur and from each other, when in adult summer plumage, but in immature and winter plumage they bear considerable resemblance to each other. The painted longspur (*Calcarius pictus*) breeds in the valleys of the Yukon, Mackenzie, and Saskatchewan rivers, but in winter ranges south and east as far as Illinois. The chestnut-collared longspur (*Calcarius ornatus*) is the best known of the American species, as it breeds in great numbers on the prairies of Dakota and Montana. Its nest is a scanty collection of grass and weed stalks in a hollow on the ground, and the eggs, usually four, are white with purplish and brown markings. None of the longspurs are really singers, the notes, though pleasing, being weak and twittering. The last of our four species, sometimes called black-breasted longspur (*Rhynchophanes McCounii*), differs from the preceding trio in the much stouter bill and the shorter and more curved hind claw. It is quite different also in appearance when in breeding plumage, but its habits, nest, eggs, and song are not essentially different. It occurs during the summer from Colorado northward to the valley of the Saskatchewan, but does not pass west of the Rocky Mountains nor east of the Mississippi River; in winter it ranges from Colorado southward into Mexico. Consult American ornithologies, and especially Coues, *Birds of the Northwest* (Washington, 1874).

LONG′STREET, AUGUSTUS BALDWIN (1790-1870). An American lawyer, educator, and humorist, born in Augusta, Ga., September 22, 1790. He graduated at Yale (1813) and practiced law in Georgia, becoming a district judge in 1822 and holding the office for several years. He then resumed practice and did editorial work in Augusta, where he established the *Sentinel*, soon merged with the *Chronicle* (1838). He became a Methodist minister, and in a year was made president of Emory College (1839). After nine years he accepted the presidency of Centenary College, Louisiana, then of the University of Mississippi. After six years in the last position he resigned and became a planter, but was tempted by the presidency of South Carolina College (1857), and in a few years he was back again at his old presidency in Mississippi. He had a great sectional reputation as a speaker and as a vehement States' rights man, and he was a voluminous writer. His fame is based, however, on a single book, *Georgia Scenes*, originally published in newspapers, then gathered into a volume at the South, and finally issued in New York in 1840. It is said that he disowned the second edition (1867) and tried to destroy the first. He died in Oxford, Miss., September 9, 1870.

LONGSTREET, James (1821-1904). A distinguished Confederate General in the American Civil War. He was born in Edgefield, S. C., removed to Alabama with his parents in 1831, graduated at the United States Military Academy in 1842, and was afterwards stationed at various places on the Western frontier. In the Mexican War he served with distinction in both the Northern and Southern campaigns, received the brevet of captain and major for gallant and meritorious conduct at Contreras and Churubusco, and at Molino del Rey, and was severely wounded in the assault upon Chapultepec. Afterwards he served chiefly on the Texas frontier, becoming paymaster in 1858. At the outbreak of the Civil War he resigned his commission in the United States Army, and entered the Confederate service with the rank of brigadier-general. He participated with distinction in the first battle of Bull Run, and was made major-general in 1862. In the first part of the Peninsular campaign he commanded Joseph E. Johnston's rear-guard during the retreat before McClellan. He took part in the Seven Days' Battle and the second battle of Bull Run, where his opportune arrival and masterly generalship were instrumental in securing the victory over Pope. (See Bull Run, Second Battle of.) After the battle of Fredericksburg, in which he commanded the Confederate left and repulsed Burnside's gallant but foolhardy attacks (see Fredericksburg, Battle of), he was promoted to a lieutenant-generalship. At Gettysburg, after having strongly opposed Lee's plans before the battle, and having advocated the interposing of the Confederate army between the Federal Army of the Potomac and Washington—a policy which he believed would force Meade to fight on disadvantageous terms—he commanded the right wing of the Army of Northern Virginia, thus directing, under Lee, the most stubborn fighting in that three days' conflict, including the famous charge of Pickett. (See Gettysburg, Battle of.) He then was transferred to the Army of Tennessee under Gen. Braxton Bragg (q.v.), and at the battle of Chickamauga (q.v.), by making an opportune attack, he was instrumental in carrying the day. After undertaking an unsuccessful movement against Burnside, who occupied a strong position at Knoxville, he joined Lee in Virginia early in 1864. He took a distinguished part in the Battles of the Wilderness, where he was severely wounded. He recovered in time, however, to command the First Corps of the Army of Northern Virginia during the second half of the year 1864. General Longstreet enjoyed the distinction of being one of the greatest fighters of the Confederacy, and possessed the unbounded confidence and affection of his soldiers. After the close of the war he engaged in business as a cotton factor in New Orleans, where he later became a Republican in politics, and from 1869 to 1873 held the office of Surveyor of Customs at the Port of New Orleans under General Grant. Later he held the offices of Supervisor of Internal Revenue in Louisiana and Postmaster at New Orleans. In 1875 he removed to Georgia, and in 1880-81 was in Turkey as United States Minister. In 1898 he was appointed United States Railway Commissioner. Besides writing for the magazines, he published a valuable work dealing with the Civil War, entitled *From Manassas to Appomattox* (Philadelphia, 1896).

LONGSWORD. A surname of William the Conqueror.

LONG-TAILED HUMMER. A humming-bird (*Aithurus polytmus*) of Jamaica, remarkable for the male having the feathers of the tail next the outermost on each side three times as long as the other rectrices, and curved so that they cross near their centres. The head is provided with a long black crest. It is very common in Jamaica, where many may sometimes be seen about a flowery bush, opening and shutting the long feathers of the tail with beautiful effect. The nest is composed of silk cotton, the outside quite covered with spiders' webs, and built of lichens and bark. See Colored Plate of Humming-Birds.

LONGTON. A town of Staffordshire, England, in the potteries district, two miles southeast of Stoke, on a tributary of the Trent (Map: England, D 4). It owns profitable gas-works and markets, and maintains baths, cemeteries, free library, technical schools, refuse destructor, and the Queen's Park, a beautiful recreation-ground. Its growth was due to the manufacture of china and earthenware, and the presence of rich iron and coal mines in the neighborhood. It was incorporated in 1865; in 1884 its boundaries were enlarged. Population, in 1891, 34,327; in 1901, 35,800.

LONGUEUIL, lôN'gẽ'y'. A summer resort of Chambly County, Quebec, Canada, on the right bank of the Saint Lawrence, opposite Hochelaga, the east ward of Montreal city (Map: Quebec, C 5). It is much frequented for boating and bathing and contains the homes of many Montreal citizens. Population, in 1891, 2757; in 1901, 2835.

LONGUEVILLE, lôNg'vêl', Anne Geneviève de Bourbon-Condé, Duchess of (1619-79). A noted leader of the Fronde (q.v.) during the minority of Louis XIV. of France. She was born in the donjon of Vincennes, where her father, Henry II. of Bourbon, was a prisoner. She was the sister of the great Condé and the Prince de Conti. In 1642 she became the wife of the Duke de Longueville, an old roué. She was a woman of singular beauty and charm, and among her many admirers was the Duke de la Rochefoucauld, author of the *Maximes*, who exercised a marked influence upon her character and developed the political ambition which thereafter directed her career. She became one of the leading spirits in the Fronde. When her husband and brothers were arrested and imprisoned by the Queen Regent, Anne of Austria, in January, 1650, she attempted to bring about a rising in Normandy against Mazarin, but failed. She made her escape and went to Stenay, where she induced Turenne to turn against the Court and compel the release of the prisoners. For a short time she returned to the social circle that gathered at the Hotel Rambouillet; but her brothers, Condé and Conti, having again broken with the Mazarin Government, she joined them at Bourges and Bordeaux. The party, however, fell asunder and the Duchess returned to Paris, pardoned through the efforts of her husband. After the death of the latter, in 1663, she lived in seclusion. She retired to the Convent of the Carmelites, was a friend of the Jansenists, and when their persecution was renewed, it was under her roof that the 'great Arnault' found shelter. Consult the admirable studies of Cousin, *The Youth of Madame de Longueville*, trans. from the French (New York, 1854); *Madame de Longueville pendant la Fronde* (Paris, 1853); Cock, *The Life of Madame de Longueville (Anne Geneviève de Bourbon)* (New York, 1899).

LON'GUS (Lat., from Gk. Λόγγος)(flourished probably in second century A.D.). A Greek writer, probably a native of Lesbos, the scene of his romance, *Daphnis and Chloë* (Δάφνις καὶ Χλόη), which is a story of shepherd life, and, although marred by some passages repulsive to modern taste, contains much that is charming. It enjoyed a great vogue, especially at the time of the Renaissance. It was edited by Hercher, *Scriptores Erotici Græci* (Leipzig, 1858). There is an English translation by Smith, *The Greek Romances of Heliodorus, Longus, and Achilles Tatius* (London, 1855). See also *Daphnis and Chloë, The Elizabethan Version from Amyot's Translation by Angel Day. Reprinted from the unique original and edited by Joseph Jacobs* (London, 1890); Rohde, *Der griechische Roman* (2d ed., Leipzig, 1900), pp. 531 ff.

LONG'VIEW. A town and the county-seat of Gregg County, Tex., 122 miles east of Dallas; on the International and Great Northern, the Texas and Pacific, and the Texas, Sabine Valley and Northwestern railroads (Map: Texas, G 3). It has the principal offices of the Texas, Sabine Valley and Northwestern Railroad, lumber-mills, a cottonseed-oil mill, foundry, and plow-works, and carries on an important trade in lumber, live stock, hides, etc. A mineral well in the vicinity is noted for its medicinal properties. Population, in 1890, 2034; in 1900, 3591.

LONG WALLS OF ATHENS. The walls constructed B.C. 460-458 under Pericles, connecting Athens and the Piræus. Their construction was suggested by Themistocles, and Cimon is said to have begun their foundation. The northern of the two walls was called the Piraic wall, the southern the Phaleric. They extended for a distance of five miles between the two cities and ran parallel, 550 feet apart, branching out as they approached each town and joining the city walls. They thus made of Athens and the Piræus one city, impregnable as long as it retained its naval preëminence. After the Peloponnesian War Lysander is said to have had them, together with the wall of the Piræus, pulled down to the sound of the flute. They were restored by Conon, after the victory of Cnidus, and subsequently repaired at various times. They were finally demolished by Sulla. A third long wall has been assumed on the authority of a passage in Thucydides, but no trace of its course has ever been discovered, and the statement probably refers to the double Piraic wall.

LONG'WORTH, NICHOLAS (1783-1863). An American horticulturist, born in Newark, N. J. When a young man he became a banker and merchant in Cincinnati, but took active interest in agricultural subjects. Especially is he noted for his efforts to establish grape-growing in the Ohio Valley. So successful was he that he has been called 'The Father of American Grape Culture.' Not only was he a pioneer and leading horticultural expert in his section, but was recognized as an authority in national horticultural matters. His writings, though individually short and now out of date, exercised a wide influence in his day.

LONGWY, lôɴ'vē'. A fortified town in the Department of Meurthe-et-Moselle, France, 18 miles southwest of Luxemburg, near the Belgian frontier (Map: France, M 2). It consists of two parts, Longwy-Haut, the upper and fortified town above the river Chiers, commanding an extensive view, and Longwy-Bas, the lower town, with factories and porcelain-works. In the vicinity are valuable iron-mines. Longwy, called the 'Iron Gate of France,' has belonged to that country since 1678; it was taken by the Prussians in 1792, in 1815, and in 1871. Population, in 1901, 9235.

LONIGO, lô-nē'gô. A district town in the Province of Vicenza, Italy, situated on the river Gua and on the Verona-Venice Railway line, 14 miles southwest of Vicenza (Map: Italy, F 2). It has two interesting mediæval towers and a palace. The chief products are hemp, grain, wine, and some textiles. A very important fair is held at Lonigo from March 20th to 29th. Population, in 1901, 10,403.

LÖNNROT, lẽn'rōt, ELIAS (1802-84). A Finnish philologist, born at Sammatti in Western Nyland. He studied medicine and practiced for several years, but always devoted the best of his effort to linguistic study and to the collection of the old Finnish popular poetry. In 1853 he was appointed to the chair in Finnish in the University of Helsingfors, but resigned in 1862. Lönnrot edited: *Kantele* (1829-31), containing ancient and modern folk-songs; *Kalevala* (1835), which to him as collector owes its existence as an integral epic; a collection of minor lyrics, *Kanteletar* (1840); Finnish proverbs, *Sanalaskuja* (1842), and riddles, *Arvoituksia* (1844); and wrote: *Om det nord-tschudiska språket* (1853); *Flora Fennica* (1860); and the great work, *Finskt-svenskt lexikon* (1874-80). Consult: Ahlqvist, *E. Lönnrot* (Helsingfors, 1884); Nervander, *Från E. Lönnrot Ungdomstid på Laukko* (Helsingfors, 1894); and Comparetti, *Der Kalewala* (Halle, 1892).

LONS-LE-SAUNIER, lôɴ'-le-sō'nyā'. The capital of the Department of Jura, France, situated amid vine-clad hills, 56 miles by rail southwest of Besançon (Map: France, M 5). It has monuments to General Lecourbe, a native of the town, and Rouget de l'Isle, the author of the *Marseillaise*, born near Lons-le-Saunier. The town hall has collections of antiquities, sculptures, and paintings, and a library. The theatre and the lycée are the chief educational institutions. The saline springs of the town, formerly used for the production of salt, have been converted into a bathing establishment. In the vicinity are situated the extensive salt-works of Montmorot. Lons-le-Saunier produces salt, footwear leather, and wine, and trades in agricultural and dairy products. The town is of Gallic origin and was known in ancient times as *Ledo Salinarius*. Population, in 1891, 12,610; in 1901, 12,935.

LÓNYAY, lōn'yŏ-ĭ, MENGHÉRT, Count (1822-84). An Hungarian statesman, born of a noble Protestant family and educated at Pesth. He was elected to the Diet when he was only twenty-one and became a member of the party of the opposition, although he did not favor Kossuth's policy of a protective tariff. Under-Secretary of Finance in the Ministry of 1848, he fled to Paris in the following year, after the suppression of the insurrection. But he returned in 1850 under the provisions of a special amnesty and became especially interested in the reconstruction of Hungarian finance, the amelioration of economic conditions, and the settlement of the relations of Church and State. He was especially prominent in procuring the patent granting autonomy to the Protestant Church in Hungary (1859). He became Hungarian Minister of Finance in 1867, Imperial Minister of Finance in 1870, and Hungarian Premier in 1871. In December, 1872, the Left forced him to resign. Lónyay was President of the Hungarian Academy from 1875 to his death. He wrote various works on economics and finance.

LOC, lō, CHARLES ANDRÉ VAN (1705-65). A French painter and sculptor, usually called Carle Vanloo. He was born at Nice, the son of Louis van Loo (c.1641-1713), and brother of Jean Baptiste van Loo (q.v.), whose pupil he was and with whom he went to Rome, where he studied under Benedetto Luti and the sculptor Le Gros. After the death of Le Gros in 1719 he returned to Paris, assisted his brother in the restoration of the frescoes at Fontainebleau, obtained the Prix de Rome in 1724, and returned to Rome in 1727. There he became a member of the Accademia di San Luca, and in 1731 was knighted by the Pope. After his return to Paris in 1734 he was received into the Academy in 1735, was made professor in 1737, subsequently rector, and in 1763 director of the Academy and first painter to the King. In the Louvre are his "Æneas Carrying Anchises from Troy" (1729); "Marriage of the Virgin" (1730); "Apollo and Marsyas" (1735); "Iphigenia;" and a portrait of "Queen Maria Leczinska" (1747).

LOO, JEAN BAPTISTE VAN (1684-1745). A French painter. born at Aix (Provence). He was a son and pupil of Louis van Loo. After having worked for a time at Toulon and other cities in Southern France, also in Turin and Genoa, he went in 1717 to Rome, studied there under Benedetto Luti, and in 1719 accompanied his patron, the Prince de Carignan, to Paris. In 1720 he restored the frescoes of Il Rosso and Primaticcio at Fontainebleau, and subsequently executed commissions for several churches and the Hôtel de Ville. He became a member of the Academy in 1731, and adjunct professor in 1733. From 1738 to 1742 he was in England, where he was favored with the patronage of Robert Walpole, who introduced him to the Prince and Princess of Wales. Among the first portraits he painted were those of Colley Cibber and Owen MacSwinny, and soon his striking likenesses were in demand above those of all other painters in London. Impaired health caused him to seek relief in his native town, where he died. His best historical paintings include: "Diana and Endymion" (1731), and "Institution of the Order of the Holy Ghost in 1578," both in the Louvre; "Christ Entering Jerusalem," Saint Martin des Champs, Paris; "Triumph of Galatea" (1722), in the Hermitage, Saint Petersburg; and "Massacre of Zedekiah's Children," in the Darmstadt Museum, which also contains fine portraits of Louis XV. and his Queen.

LOO-CHOO, LU-CHU, LIU-KIU, LIU-CHIU, or **RIU-KIU.** A chain of 55 islands (36 of them inhabited) which originally formed the Kingdom of Loo-choo, but which are now a part of the Empire of Japan. They lie in the Pacific Ocean between the parallels of 24° and 30° N., and the meridians of 122° and 130° E., and extend in a southwest direction from Colnet Sound, which forms the south boundary of the island of Kiushiu toward the northeast coast of Formosa, from which they are distant about 80 miles. The total area is 934 square miles.

The chief islands are Anami-Oshima, Tokunoshima, Okinawa-shima, Ishigaki-shima, and Iriomote-shima. The most important of these is Okinawa, on which Shuri, the capital, is situated. Okinawa-shima and the southern groups are of coral formation; but farther north the islands are of volcanic origin and rise steeply from the ocean. In some places the hills rise to heights of 1400 to 1500 feet, but in Okinawa the country is comparatively low and undulating, with rounded hills 400 to 500 feet in height. The prevailing rocks are gneiss, hornblende, and granite, overlain with much weathered sedimentary strata. Coralline limestone is abundant. The climate is healthful and pleasant; the mean temperature is about 70° F., the mean humidity 78, and the rainfall for the year 84.69 inches. The islands suffer much from typhoons.

The soil is fertile and well cultivated. The most valuable crop is sugar. The largest is sweet potatoes, on which the great bulk of the population subsists; six kinds of rice, three of barley and wheat, and six sorts of beans are produced, as well as immense quantities of vegetables of all sorts, including gourds and melons. Two crops of rice a year can be grown. Cotton, Satsuma tobacco, and a little tea are also raised, but the main supply of tea comes from Japan. The sago-palm is extensively cultivated, and oranges of a peculiar aromatic flavor are grown. Plantain-trees furnish the fibre which the women weave into the principal fabric made on the island. Fish of many kinds, including sharks, abound on the coast. Pigs are extensively reared; and there is a fine breed of ponies, 10 to 10½ hands high. There are no beasts of prey, but venomous snakes called *habu* abound, and infest even the houses. They are from 6 to 7 feet long, 2½ to

3 inches in diameter, and their bite is speedily mortal.

The people are probably of the same stock as the Japanese, whom they resemble to a great extent in their manners and customs. They are mild-mannered and courteous, and to the Chinese the Kingdom is known as the 'Land of Propriety.' Those of the higher classes are as secluded as in China. Women tattoo their hands. The tombs are built of stone on the hillsides, and are horseshoe-shaped as in China. The dead are buried in coffins, but in the third year, when the flesh has rotted away, the bones are washed with saké and placed in urns.

The language is closely allied to Japanese, especially the Japanese of several centuries ago, and in both its accidence and syntax it greatly resembles Korean. It has no alphabet, Chinese having been for centuries the medium of communication, and Chinese literature, history, and philosophy the chief study of the learned. Two sects of Buddhism were introduced, but religion is now in decay and there is hardly a temple or a shrine. The population, at the close of 1898, was 453,550.

The Kingdom of Loo-choo first appears in Chinese history in the year 610, but little is known of it before 1187, when one Sunten, said to have been a son of the famous Japanese warrior Tametomo (q.v.), ascended the throne. In 1372 it became tributary to China, sending a mission to Peking every other year, and its kings receiving investiture from the Emperor. The first intimate relations with Japan began in 1451, when presents were sent to the Ashikaga Shoguns. In 1609 the islands became subject to the Daimio of Satsuma, and from that time tribute was paid to both countries until 1874, when China relinquished her claims by treaty with Japan, and the Japanese garrisoned the chief city and its seaport. In 1876 Shotai, the King, was carried to Tokio and made a marquis (died August 19, 1901), and in 1879 the islands not already included in Kagoshima Prefecture were incorporated into the Japanese Empire; the ken or prefecture of Okinawa (q.v.) was established, and grouped with the nine provinces of Kiushiu. The people, however, are still without the elective franchise. See *China Review*, vol. viii. (Hong Kong, 1879); *Transactions of the Asiatic Society of Japan*, vol. i. (Yokohama, 1874); also vol. iv. (1876); vol. xxi. (1893); vol. xxiii. (1895) on *Luchuan Language;* and vol. xxiv. on *Luchuan Bibliography* (1896). Also *Journal of the Society of Arts* (London, 1881); and *Journal of the Royal Geographical Society*, vol. v. (London, 1895).

LOOFS, lōfs, FRIEDRICH (1858—). A German Lutheran theologian, born at Hildesheim, Hanover. He studied at Leipzig, Tübingen, and Göttingen; was appointed a lecturer in Church history at Leipzig in 1882; received a professorship there in 1886; and in 1887 obtained appointment to a professorship in Halle, where he subsequently occupied the chair of Church history. His writings number: *Antiquæ Britonum Scotorumque Ecclesiæ* (1882); *Leitfaden zum Studium der Dogmengeschichte* (1889, 3d ed. 1893); *Predigten* (1892-1901); *Studien über die dem Johannes von Damaskus zugeschriebenen Parallelen* (1892); *Anti-Haeckel* (1900; 4th ed. in that year); *Grundlinien der Kirchengeschichte* (1901).

LOOK AND SAY METHOD. See READING.

LOOKDOWN. A name about Chesapeake Bay for the horsehead or silver moonfish (*Selene vomer*). See MOONFISH.

LOOKOUT, CAPE. See CAPE LOOKOUT.

LOOKOUT MOUNTAIN, BATTLE OF. See CHATTANOOGA, BATTLE OF.

LOOK-UP LEGION. See LEND A HAND CLUBS.

LOOM (AS. *ge-loma*, *aud-loma*, tool, instrument, implement). The machine by which weaving is effected. In its essence, weaving consists in passing one set of threads transversely through another set, divided into two or more series and moved alternately up and down, so as to receive the transverse threads in passing, and interlocking them, forming thereby a united surface. The machine, in order to accomplish this result, must be capable of three distinct movements; first, the forming of the *shed*, that is, separating the threads of the *warp*—as the threads which run throughout the length of the finished fabric are called, which have been wound upon the *warp-beam* and placed in the loom—into two or more series, raising a part and depressing the balance, leaving a space between, through which the *weft* or *filling* is passed; second, the passing of the *shuttle* containing the *bobbin* of filling through the shed so formed either by hand or mechanical means; third, beating up this thread of filling left in the shed by the shuttle against the one which preceded it. The process of weaving is simply a continued repetition of these three movements in the order named.

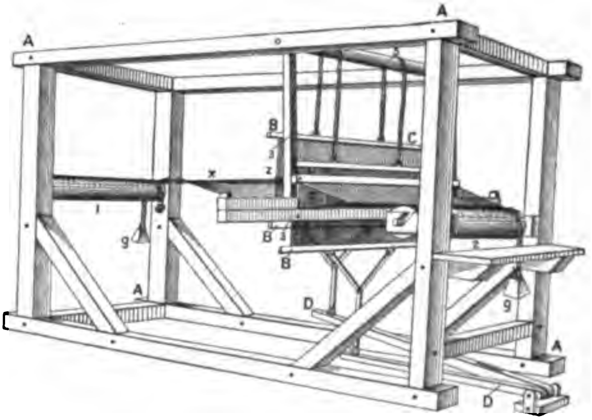


FIG. 1. HAND-LOOM.

The main function of the loom is to hold the working parts in their proper position. In the ordinary *hand-loom*, Fig. 1, two rollers, 1, 2, are placed one at each end of the *frame*, AAAA, so that they will readily turn on the axes; and from one to the other the threads of the warp, X, are stretched after having been drawn through the eyes of the *heddles*, Z, of the *loom-harness*, BC, and the *reed*, which is a frame suspended from the batten, 3, and are kept tight by weights, *gg*. If the cloth to be woven is to be a 'plain' cloth—that is, one in which every second warp-thread is above the filling-thread, while the alternate threads are below and the positions of the warp-threads are reversed for the next filling-thread—then two heddle-frames or harness are required and the warp-threads are drawn through the eyes of the heddles, threads one, three, five, etc., being arranged on the first of the two harness while the threads two, four, six, etc., are arranged on the second. After being 'drawn' in the harness, the threads are 'reeded'—that is, passed through the interstices of the *loom-reed* in pairs, and the reed to be used is the one to give the correct number of warp-threads wanted to the inch in the finished fabric; it will hold these threads at a uniform distance apart for the full length of the warp during the process of weaving. The *loom-harness* is suspended from a roller, 5, placed at the top and near the front of the loom-frame, and each is fastened to one of a pair of treadles, DD, directly beneath; the weaver depresses first one treadle, which pulls down the harness-frame with which it is connected and simultaneously raises the second harness-frame with its attached treadle, separating the warp-threads and forming a *shed*, S, as above described. The shuttle is thrown through the shed either by the hand of the weaver or by a quick jerk imparted to it from the weaver's hand by a combination of straps and springs. After the shuttle has deposited the filling in the shed the reed, which is held firmly in a frame swinging from above called a *batten*, 3, is forced forward quickly by the hand of the weaver pressing the filling in place; the second treadle is now depressed while the heddle-frames reverse their former position, changing the relative position of the warp-threads, and the shuttle is passed through the new shed and the filling is again beaten up.

Much skill on the part of the weaver is required to operate a loom of this kind, and even with the most expert weaver the production is slow. Nevertheless, such a loom is a great improvement over the primitive apparatus on which the ancient Egyptians wove their delicate fabrics. Their loom, as well as that of the early Greeks and Romans, was as simple in its construction as the device of the native of India, who selects two near-growing tree-trunks, usually palms because of their straightness, for his loom-frame, two bamboo rollers, one for the warp, the other for the woven cloth, which he fastens at the proper distance from each other by wooden pins driven in the ground under the palms—after having dug a hole large enough to contain his legs, allowing him to sit upon the ground. The rude strapping which is to control the warp-threads is suspended from the trees, and the weaver seats himself with his feet in the hole he has prepared, and inserts his great toes in certain loops of the strapping; by alternately moving his feet up and down the shed is formed and the filling is drawn through with a stick not unlike a huge knitting-needle, which serves not only as a shuttle, but also to beat up the filling against the cloth already woven.

It seems that in nearly all the earlier types of loom the warp was placed perpendicularly, and it is not until the fourteenth century that we find the loom with the warp stretched horizontally and the heddle-frames operated by treadles. It was not until the eighteenth century, however, that a succession of improvements started the revolution which has taken place in the art of weaving. The first was a mechanical arrangement to throw the shuttle, instead of the weaver's hand. In 1733 John Kay, of England, invented a device known as the 'flying-shuttle' and 'picking-stick'—by which the shuttle received a blow and was driven through the shed, and after the shed had been changed was struck in a similar way at the other end and driven back. By this invention a much more rapid motion was obtained than was possible with the hand shuttle.

At the time of the introduction of the 'flying-shuttle' the loom was supplied with a *shuttle-box* at each end of the *batten;* these *shuttle-boxes* are receptacles which receive the shuttle as it is driven across and release it as it is driven back into the box at the opposite end; they are placed on a level with that part of the batten called the shuttle-race and can receive but one shuttle at a time, so it is obvious that should the weaver wish to introduce more than one color of thread in the filling, the loom must be stopped in order to change shuttles for each change of filling. In 1760 Kay invented the *drop-box*, an attachment consisting of a tier of shuttle-boxes, one above the other. The several compartments of the drop-box attachment could be filled with shuttles, each containing a different color of filling, and when a certain color was wanted the box, or compartment, containing that color could be brought to the level of the shuttle-race and the shuttle driven across and back until another color was wanted. The modern *box-loom*, or loom having more than one box (as the *single-box* loom has) at each end of the *lathe*, as the batten is now generally called, may have two, four, or six boxes at one end and one at the other, or two, three, or four boxes at each end; the latter are called *pick-and-pick* looms, as the shuttle may be sent across for a single pick of one color and changed at the opposite end for one with a new color, while with a loom having one box at one end it is readily seen that only multiples of two threads of filling can be used no matter how many boxes are at the opposite end, the shuttle being obliged to cross and return before the color can be changed by the drop-box.

The first successful *power-loom* was invented in 1785 by Edmund Cartwright (q.v.). Several unsuccessful attempts had previously been made to produce a practical power-loom; early in the seventeenth century there is reported to have been set up in the city of Dantzig "a rare invention for weaving four or five webs at a time without any human help." This mechanism and its author met the fate of many later inventors, for it is further recorded that "the invention was supprest because it would prejudice the poor people of the town and the artist was made away secretly." In 1678 another power-loom was constructed by a Frenchman named De Gennes, which possessed many of the features of the modern loom; but it never came into practical use. In 1762 a power-loom was set up in a weaving-mill in Manchester, but it proved a failure.

Cartwright's first loom was crude, especially as the inventor was unacquainted with practical mechanics or with the art of weaving; but he continued his efforts until he produced a satisfactory machine. In this pursuit he spent all his time and money, and, as it did not come into general use until his patents had expired, he received no financial return for his labors. In 1808, however, Parliament voted him £10,000. It was said that he spent fully four times that sum in perfecting his loom.

During the century after Cartwright's invention the development of the loom received the attention of hundreds of inventors, and at the beginning of the twentieth century we find a vast number of different types in operation, all embodying, however, the fundamental principles of the original.

The simplest type of modern power-loom is shown in Fig. 2. The *loom-frame* supports two horizontal shafts, A, B, one above and a little back of the other and so geared together that the upper shaft, to which the power is applied, makes two revolutions to one of the lower. The upper shaft is supplied with two cranks, one at each end, near the frame, to which the *lathe*, 4, is attached with short connecting-rods, and as the shaft revolves it imparts to the lathe a reciprocating motion as the latter swings on the pivot, 5, 5, at the bottom of the loom-frame. The lower shaft is supplied with certain attachments called cams, near the centre, which work in contact with the *loom-treadles*, C, D; the latter are connected to the harness-frames, *xy*, *xy*, suspended from a roller, 3, 3, above, and as the shaft revolves first one is depressed and then the other, forming sheds with the warp as in the hand-loom. The lower shaft is also supplied with certain appliances, 6, 6, which act on two special *rocker-shafts*, 7, 7, one at each end of the loom, placed at right angles to and in a horizontal plane above the lower shaft and each having an arm, 9, to which is connected a *picker-stick*, *g*, *g*; these picker-sticks are so arranged that when the lower shaft revolves the action on the short rocker-shafts causes the picker-stick on one side to be jerked quickly toward the warp which is being woven and to throw the shuttle from that side of the loom through the shed into the *shuttle-box*, H. H. at the opposite end, where it remains until the filling is beaten up by the action of the lathe, and the harness change position, forming a new shed, when the second picker-stick is acted on as was the first and the shuttle is driven back to its former position and the operation is repeated continuously.

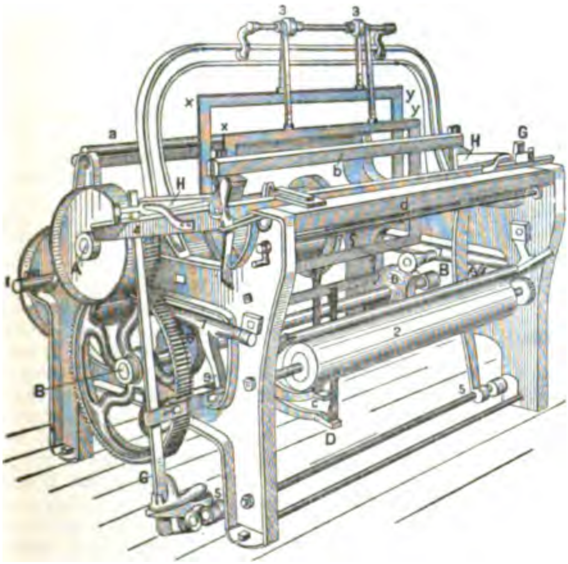


FIG. 2. POWER-LOOM.

In this loom the warp is not stretched directly from the *warp-beam*, 1, to the *cloth-roll*, 2, as in the hand-loom, but is carried upward at an angle from the warp-beam over a support called the *whip-roll*, *a*, from which it is stretched, through the harness and reed—which are held firmly in the lathe by the *hand-rail*, *b*—to the *breast-beam*, *d*, over which the cloth passes downward to the cloth roll; it will be seen that by this arrangement the loom is made to take up much less space than it would in any other form. The modern power-loom also combines a number of appliances which were made necessary by the application of power and which make it possible for the weaver to keep a number of looms running, while the hand-weaver could run but one. Of these special attachments may be mentioned the *filling-stop motion*, which automatically causes the loom to stop, should the filling become exhausted in the shuttle, or break; the *shuttle-protector*, which is so arranged that should the shuttle for any reason fail to reach its place in the shuttle-box to which it has been driven, the loom is stopped and held so that the lathe will not cause any of the warp-threads to be broken should the shuttle happen to be caught in the shed and the loom not stop; the automatic *take-up* and *let-off motions*, which let the warp unroll from the warp-beam at the required speed and wind up the woven cloth automatically, regulating the number of filling-threads to the inch. There has also recently been perfected the *warp-stop motion*, which is arranged to act on the driving motion of the loom and to cause the loom to stop immediately should one of the threads of the warp become broken.

As labor is a large item in the cost of production, much experimenting has been done to perfect a loom which would either change an empty shuttle for a full one automatically, or else furnish a full bobbin of yarn to the empty shuttle without the loom stopping. The *Northrop loom*, Fig. 3, is the only one which has proved practical enough to be installed in any number as yet; there were over 70,000 of these in operation at the beginning of 1903, though the invention only dates from 1894. In this loom the loom-shuttle and one of the shuttle-boxes are made without any bottom, and above this shuttle-box is arranged a magazine or hopper which is kept supplied with a large number of full bobbins; as the filling in the shuttle runs out, the mechanism of the loom so acts on one of the fresh bobbins of yarn that it is forced downward into the shuttle and in turn forces the empty bobbin out through the holes in the bottom of the shuttle and the shuttle-box, and the loom continues to run as if no change had been made.

The above principle has as yet only been applied to looms weaving the simpler kinds of cotton fabrics, and only to weave fabrics when there is to be but one filling in kind or color throughout the warp. This loom is almost invariably supplied with the warp-stop motion, already mentioned, and weavers are running sixteen to twenty of them on print-cloths, instead of eight of the common loom.

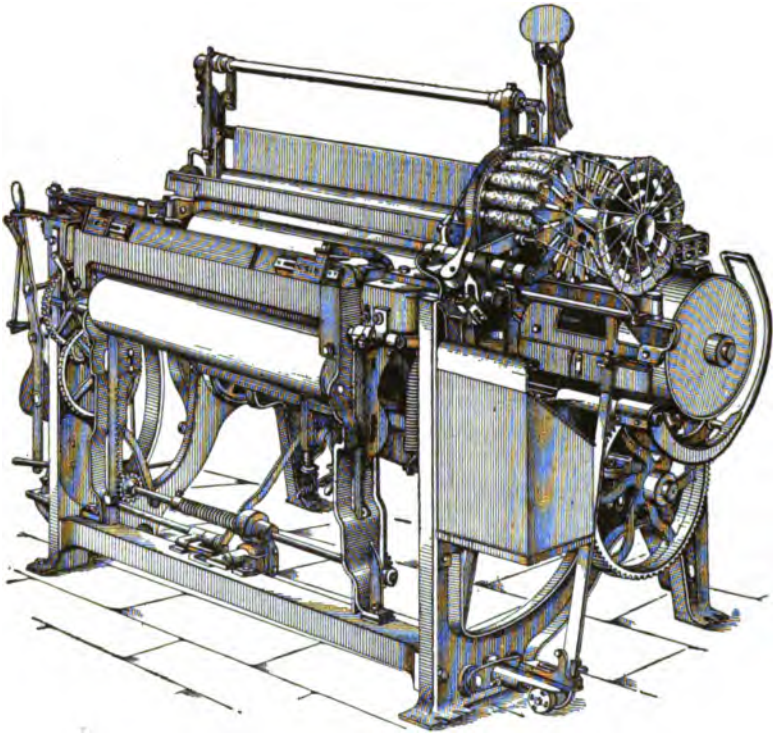


FIG. 3. NORTHROP LOOM.

Looms for fabrics which require not more than five harnesses to produce the weave are generally called *cam-looms*, for the reason that the harness is operated by the action of cams on the loom-treadles. For fabrics which require more than five harnesses, special *fancy-looms* are arranged; these usually have a *head-motion*—a mechanism which regulates the pattern to be woven and may control the movement of as many as thirty harnesses; *dobbies* and *witches* are special head-motions.

Looms for the weaving of figured patterns are fitted with the *Jacquard machine*, an appliance invented originally by Joseph Marie Jacquard (q.v.), an ingenious Frenchman. He succeeded in producing a machine whereby an ordinary workman could with comparative ease produce the most beautiful patterns in a style which had previously only been accomplished with great patience, skill, and labor.

The machine, Fig. 4, may be applied to almost any style of loom and is simply a head-motion to control the loom-harness and to form the shed. It consists of a set of perpendicular *hooks*, AB, AB, connected with and controlled by a set of horizontal *needles*, C, C; above these hooks—which are placed in four, six, eight, or twelve rows to the machine, which may have from 200 to 1200 or more hooks—is a set of knives, I, I, called a *griffe*, with one knife for each row of hooks. To the lower extremity of each hook is attached a loop of twine called the *neck-cord*, *d*, which is passed through the *bottom-board*, 2, 2, having perforations immediately under each hook; from the neck-cords hang the *leash-strings*, E, E, and there may be from one to half a dozen of these to each hook. These leash-strings are passed through a board placed horizontally a little above the warp to be woven, called the *comber-board*, 3, 3, having rows of perforated holes to correspond with the number of warp-threads. This board is divided into sections, and in what is called a straight tie-up of the harness there are as many leash-strings to each hook as there are sections; in the illustration given there are four sections.

Below the comber-board and at the place where the shed is to be formed each leash-string is supplied with an eye called a *mail*, F, F′, through which the warp-thread to be controlled is passed; and to the lower end of each leash-string is attached the *lingo*, *g*, *g′*, a small weight to draw it down. The neck-cord, leash-strings, mail, and lingos make up the Jacquard harness. The needles are held in place by a *needle-board*, 4, 4, which is made with rows of holes through which the ends of the needles pass about three-eighths of an inch, pointing to the front, and a *spring-box*, 5, 5, at the back having a series of spiral springs, one for each needle, which, pressing the needle to the front, keep the hooks in a vertical position. The pattern to be woven is regulated by an endless chain of heavy pasteboard cards, L, L, L, which pass over a square prism, called the *cylinder*, O P Q R, which is caused to revolve intermittently by swinging in and out like a pendulum in an arc, the cord of which is little longer than the cylinder is square; as the cylinder swings out the *catch*, *x*, engages one of the pins, O, P, Q, R, causing the cylinder to make a quarter revolution, bringing a new card into position. The cylinder is perforated with rows of holes to correspond with the needles of the machine, and when the bare cylinder is allowed to come in contact with the needle-board, the needles projecting through the latter readily enter the perforations without moving the hooks; but the pattern-cards are so perforated that for all warp-threads that are to be raised above the filling in the woven pattern holes are cut for the needles which control them to pass through, the holes being cut to superimpose the holes in the cylinder; but holes are not cut in the cards for the needles controlling those warp-threads which are not to be raised.

After the chain of cards is placed on the card-cylinder and the pattern-card, which just covers one face of the cylinder, is brought in contact with the needles projecting through the needle-board, those needles which are opposite the holes cut in the card pass through and enter the perforations in the cylinder as if no card were there, while wherever there was no hole cut the needle is forced back, and with it the top of the hook which it governs, to a position so that the griffe, 1, 1, as it is raised, 1′, 1′, passes the hooks and the knives only engage and lift the hooks which have not been pushed back by the card; and every hook in the machine which has not been pressed back is raised by the griffe and with it the harness attached to it and the warp-threads which it controls. Thus it is obvious that any desired interlacing of the threads in the fabric can be obtained by the way in which the pattern-cards are perforated, each separate card regulating the warp-threads for the entrance of one thread of filling, and there being as many cards necessary as there are filling-threads in one repeat of the pattern; some very elaborate designs have required the use of 20,000 to 30,000 cards for a single design.

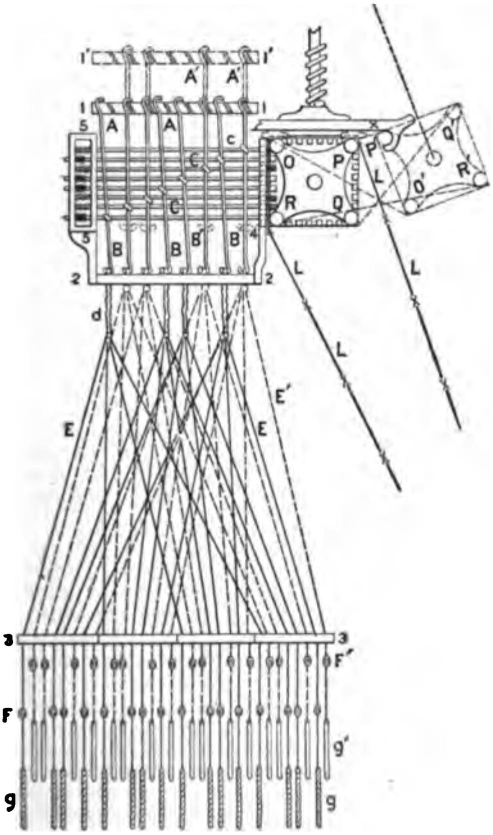


FIG. 4. JACQUARD MACHINE.

There have been many different looms produced to weave special fabrics, all embodying the three principal movements necessary to the process of weaving. Broadly speaking, looms are classed as *narrow looms* and *broad looms*, the former being built to produce fabrics up to forty-eight inches in width, the latter up to one hundred or more inches in width. There are special looms for carpets and rugs, and looms specially arranged for weaving seamless bags and tubing, such as lawn-hose or fire-hose is made from. There are *narrow-fabric looms* arranged to weave tapes and ribbons; one loom-frame supports the harness and mechanism for controlling them, and a number of separate warps are arranged side by side—sometimes as many as forty—and woven simultaneously. The special feature of looms of this description is that the shuttles are passed through the sheds by a positive motion at a uniform velocity instead of being driven through with picker-sticks; or the filling may be carried through the shed with a needle attachment instead of a shuttle.

In the *swivel-loom*, by the introduction of a special filling interlacing with a small section of the warp instead of extending from selvedge to selvedge, as the regular filling does, the weaver is enabled to produce special striped or figured effects; the attachment for manipulating this special filling-thread is so arranged that certain filling-carrying devices may be brought into the line of the open shed when the special filling is to be introduced and the shuttle carrying the regular filling stopped until the special filling is inserted, when the attachment is removed from the shed automatically, and the regular filling for the groundwork of the fabric is again passed through its shed.

There are three appliances of importance which, while not parts of the loom proper, are to be found in use on all looms, whether hand or power—the *loom-harness*, the *loom-reed*, and the *shuttle*. The *loom-harness* may be a set of two parallel rods somewhat longer than the fabric is to be woven in width, on which are arranged twine *healds* or *heddles*, with eyes at the centre for the warp-thread; or a skeleton frame on which are placed wire heddles; or the Jacquard harness, which has already been described. The *loom-reed*, though originally constructed from pieces of reed, is a series of thin pieces of flattened wire inserted at right angles in two parallel strips of wood which are from three to five inches apart, according to the fabrics on which they are to be used; the wires are spaced equally over the whole length of the reed, which is usually longer than the loom harness, and the reed is nearly always designated by the number of spaces to one inch. The *loom-shuttle* is of hard wood, generally in the shape of a prism one to two inches square and from a three to five inches apart, according to the fabric to be produced, and reduced to a point at each end, tipped with metal; this prism is hollowed out not unlike a small boat, and the filling, usually arranged on a tube or bobbin, is secured on a spindle in the cavity in such a way that the filling-thread may be pulled off from the small end of the bobbin through the eye of the shuttle.

BIBLIOGRAPHY. Consult: Posselt, *Textile Machinery Relating to Weaving* (Philadelphia, 1901); Byrne, *Progress of Invention in the Nineteenth Century* (New York, 1900); Ashenhurst, *Weaving and Designing for Textile Fabrics* (London, 1887); Brown, *Practical Treatise of the Construction of the Power Loom* (Dundee,

1887); Barlow, *The History and Principles of Weaving by Hand and by Power* (London, 1879); Posselt, *Jacquard Machine Analyzed and Explained* (Philadelphia, 1893); also Patent Office Reports. See WEAVING.

LOO′MIS, ALFRED LEBBEUS (1831-95). An American physician. Born at Bennington, Vt., he was graduated from Union College in 1851. He studied medicine at the College of Physicians and Surgeons, New York, and was graduated in 1852. At this time the science of auscultation and percussion was developing very rapidly; and this circumstance, with perhaps the additional reason that he himself had a tuberculous tendency, led him to adopt diseases of the lungs and heart as his specialty. He was appointed visiting physician to Bellevue Hospital in 1859, and became lecturer on physical diagnosis at the College of Physicians and Surgeons in 1862. Shortly after this his health broke down completely, and he spent six months in the Adirondacks. The benefit derived from his residence there led to the establishment, years later, of the sanatorium at Saranac and the Hospital for Consumptives at Liberty, N. Y. In 1866 he became professor of theory and practice of medicine at the University of the City of New York, with which institution he was identified for the rest of his life. In five years Loomis had become the virtual head of the Medical School of the University, and in ten years he had lifted it to the highest degree of prosperity it had ever known. His energy, skill, and reputation as a teacher refilled the students' benches, and pupils came to him from all parts of the United States. His services to the New York Academy of Medicine were no less notable. Professor Loomis was appointed visiting physician to Mount Sinai Hospital in 1874; was president of the New York Academy of Medicine in 1889-90, and again in 1891-92. He published *Lessons in Physical Diagnosis* (New York, 1870); *Lectures on Fevers* (ib., 1877); and *A Text-Book of Practical Medicine* (ib., 1884). He was, in addition, editor of *An American System of Medicine* (Philadelphia, 1894).

LOOMIS, ELIAS (1811-89). An American mathematician, born in Willington, Conn. He was educated at Yale College, graduating in 1830; was tutor there for three years, 1833-36; spent the next year in scientific investigation in Paris; on his return was appointed professor of mathematics in the Western Reserve College, Ohio; from 1844 to 1860 held the professorship of natural philosophy and mathematics in the University of New York, and in the latter year returned to New Haven, where he held until his death the professorship of natural philosophy in Yale, and pursued his investigations in scientific and mathematical branches. Professor Loomis published (besides many papers in the *American Journal of Science* and in the *Transactions of the American Philosophical Society*) many textbooks on mathematics, all of them marked by accuracy and precision. He also published a genealogical work, *The Descendants of Joseph Loomis* (1870).

LOOMIS, GUSTAVUS (1789-1872). An American soldier, born at Thetford, Vt. He graduated at West Point in 1811, entered the army as second lieutenant of artillerists, and, after doing garrison duty in the Harbor of New York in 1812-13, was ordered in the latter year to the Niagara frontier. He assisted in the capture of Fort George (May 27, 1813), and was made prisoner at Fort Niagara on December 19th following. After the war with Great Britain he served in various capacities in different parts of the country. In 1832-33, during the Black Hawk War, he was in garrison at Fort Crawford, Wis., in 1837 and 1856-58 served against the Seminole Indians, and in 1857-58 commanded the Department of Florida. During the Civil War he was superintendent of the general recruiting service, in 1863 was retired from active service with rank of colonel of infantry, and in 1865 received the brevet of brigadier-general U. S. A.

LOOMIS, SILAS LAWRENCE (1822—). An American scientist and educator. He was born in Coventry, Conn.; graduated from Wesleyan in 1844, and, in medicine, from Georgetown University in 1856. Previous to his study at Wesleyan, he had taught at Holliston Academy, Mass.; after graduation he was principal of Western Academy, Washington, D. C., and subsequently became professor of physiology (1859-60) at Georgetown. He was astronomer to the United States Coast Survey in 1857, and instructor in mathematics to naval cadets in 1860. From 1861 to 1867 he was professor of chemistry and toxicology at Georgetown, and was afterwards a professor in Howard University. To Dr. Loomis are ascribed the invention of a process for producing a textile fabric from palmetto, a method for utilizing ores of chromium, and various improvements in instruments of precision. Besides contributions to periodicals, his works include *Normal Arithmetic* (1859), *Analytical Arithmetic* (1860), and *Key to the Normal Course* (1867).

LOÓN, lō-ōn′. The largest town of the island of Bohol, Philippines (Map: Philippine Islands, H 10). It is picturesquely situated on the extreme western coast, about 16 miles northwest of Tagbilaran. Between the town and Sandigan Island, three miles to the north, is a well-sheltered anchoring ground. Population, in 1896, 15,365.

LOON (archaic *loom*, from Icel. *lómr*, loom; confused with *loon*, ODutch *loem*, stupid fellow). In North America, a water-bird of the family Gaviadæ, especially the 'great northern diver' (*Gavia imber*). In Great Britain the word is often pronounced *loom* and is locally applied to the grebes. Arctic seamen, moreover, give this name to the guillemot (*Uria lomvia*), whose crowded nesting colonies on the cliffs they term 'loomeries.'

The loon is a bird as large as a goose, with a checkered black and white plumage of hard close feathers, rather short wings and tail, and a straight, strong, black beak, preserving the type perfected in the ancient fish-catching diver Hesperornis (q.v., for comparative illustrations); the head and neck are iridescent violet and green, with a collar of white streaks; the breast and abdomen pure white. It is a denizen of the subarctic belt of the Northern Hemisphere, where it breeds numerously about all the fresh-water lakes, ponds, and rivers, making a very slight nest on the ground and laying two greenish eggs, unspotted. In America, loons breed as far south as the Great Lakes, but are most numerous about Hudson Bay and in Alaska.

In winter they move southward and are to be seen all over the more northerly States. Other species are the red-throated loon (*Gavia lumme*), with a darker back, bluish gray head and neck, and throat marked with a chestnut patch, which is northerly in its breeding haunts, but in winter migrates as far south as Mexico; the yellow-billed loon (*Gavia Adamsi*), an Arctic resident; the black-throated (*Gavia arctica*), also Arctic; and the Pacific loon (*Gavia Pacifica*) of the North Pacific coasts. All have similar habits. They rarely come upon land, but swim well out in the open, shy and watchful, and are able to dive with such astonishing quickness and force that they can often dodge the missiles from a gun. Their food consists altogether of fish, which they chase under water with marvelous swiftness by using their wings just as in flight. Having overtaken the fish, they transfix it with their spear-like beaks, then bring it to the surface, toss it into the air and catch and swallow it head first. Their voices are prolonged raucous cries, sometimes described as a weird sort of laughter; and these cries, usually associated with lonely waters and hardship, have led to many tales and superstitions among northern peoples. An account of some of them will be found in Watters, *Birds of Ireland* (Dublin, 1853). The loons are of great service to the Eskimos of Alaska, who use their skins extensively for the making of clothing, tool-bags, etc. Consult, in addition to standard works and the books of writers on the zoölogy of Alaska (q.v.): Coues, *Birds of the Northwest* (Washington, 1874); McIlwraith, *Birds of Ontario* (Toronto, 1894); Macoun, *Catalogue of Canadian Birds* (Ottawa, 1900).

LOOPER. See MEASURING WORM.

LOOPHOLES (from *loop*, OF. *loup*, probably from Dutch *luip*, ambush, from *luipen*, to peep + *hole*). In fortifications or field works, small apertures through which the defenders may fire. See FORTIFICATION.

LOOS, lōs, CHARLES LOUIS (1823—). An American educator. He was born in Lower Alsace, France, and came to the United States in 1834. In 1846 he graduated from Bethany College, and he subsequently held pastorates at Wellsburg, Va., Somerset, Pa., and Cincinnati, Ohio. He was elected president of Eureka College at Eureka, Ill., in 1857, and from 1858 to 1880 was professor of ancient languages in Bethany College. In 1880 he became president of Kentucky University.

LOOSESTRIFE FAMILY. A popular name for an order of plants. See LYTHRACEÆ.

LOOSJES, lōs'yēs, ADRIAAN PIETERSZOON (1761-1818). A Dutch novelist, born on the island of Texel. He was educated for the Church, but afterwards became a bookseller in Haarlem. He wrote several mediocre novels, principally of the historical sort. He also wrote poems, *Minnezangen* (1784), and plays. His romances include: *Frank van Borselen en Jacoba van Beijeren* (1790-91); *Charlotte van Bourbon* (1792): *Louise de Coligny* (1803); *Johan de Witt* (1805); *Historie van Mejufvrouw Susanna Bronkhorst* (1806-07), a novel in the form of letters; *Maurits Lijnslager* (1808); and *Johannes Wouter Blommesteyn* (1816).

LOOT. A military term, denoting any property that has been pillaged from an enemy. Looting is frequently used as a synonym for pillage, or the plundering of an enemy by open force. Formerly, the privilege of looting an enemy's city or encampment was the right of the soldiery, and was frequently offered as an inducement to obtain reinforcements or recruits. Special regulations now govern the practice in all the armies of the world. See BOOTY.

LOPE DE AGUIRRE, lō'pā dā ȧ-gē'rȧ. A Spanish adventurer and explorer in South America. See AGUIRRE, LOPE DE.

LOPE DE RUEDA, dā rōō-ā'Dȧ. A Spanish dramatist. See RUEDA, LOPE DE.

LOPE DE VEGA, vā'gȧ. See VEGA CARPIO.

LOPES, lō'pāsh, FERNAM (1380?-?). Patriarch of the Portuguese historians. In 1434, at the request of Dom Duarte, then heir to the throne, he began to compile his chronicles, the chief of which is the *Chronica del rey D. Johann de boa memoria* (first printed in 1644). This work, dealing with events down to 1415, contains much matter of a romantic nature and many anecdotic elements incident to the events narrated and the chief figure treated. A certain resemblance between his methods and those of the French writer has caused him to be styled the Portuguese Froissart. Other works by Lopes are the *Chronica de D. Fernando* and the *Chronica de D. Pedro* (published in the *Ineditos de historia, portugueza*, vol. iv.). Consult Vasconcellos in *Geschichte der portugiesischen Litteratur*, in Gröber's *Grundriss der romanischen Philologie*, vol. ii. (Strassburg, 1894).

LOPEZ, lō'pās, CARLOS ANTONIO (c.1795-1862). A President of Paraguay. He was born in Asunción, and after studying civil and canon law at the ecclesiastical seminary in that city lived for a number of years in seclusion to avoid the hostility of Dr. Francia, then dictator of Paraguay. Upon Francia's death in 1840 he returned to the capital, and acted as secretary to the military junta which had become the *de facto* Government of Paraguay. In 1841 he was elected First Consul, and from 1844 till his death held the office of President, to which the Congress had elected him for a term of ten years fróm 1844, of three years from 1854, and of seven years from 1857, with power in the latter case to name his successor by will. During his administration, which was virtually a dictatorship, he began the organization of an army and navy, opened Paraguay to foreign commerce, made commercial treaties with foreign powers, built a railroad, and sent many Paraguayans to Europe to be educated. His arbitrariness and hostility to foreigners gave rise to many diplomatic difficulties between Paraguay and foreign States. His administration was in general, however, a period of internal tranquillity and material prosperity.

LOPEZ, FRANCISCO SOLANO (1827-70). President of Paraguay. He was the son of Carlos Antonio Lopez and was born at Asunción. At the age of eighteen he was appointed by his father commander-in-chief of the Paraguayan army. In 1854 he was sent to Europe on a diplomatic mission, and negotiated treaties with England, France, and Sardinia. On his return to Paraguay he assumed the office of Minister of War. He was ambitious of establishing a powerful empire in the heart of South America, and, by raising a powerful army of 80,000 men and husbanding the riches gathered by his father, prepared secretly for a forcible annexation to Paraguay of parts of Brazil, the Argentine Republic, and Bolivia. In 1862 he succeeded his father in the Presidency, and in 1864 he called on Brazil to withdraw her troops from Uruguay, where a civil war was in progress, in which Brazil had intervened. Upon the refusal of Brazil he took possession of the Province of Matto Grosso. In 1865 he invaded the Brazilian Province of Rio Grande do Sul, sending 8000 troops through the territory of the Argentine Republic for that purpose, and when the Argentine Government protested he declared war against it. Congress now conferred upon him extraordinary powers, and he invaded the Argentine Republic before the declaration of war had reached Buenos Ayres. Brazil, Uruguay, and the Argentine Republic entered into an alliance against him, and in 1866 invaded Paraguay. The war lasted four years, Lopez recruiting his forces by a conscription of all persons between the ages of twelve and seventy, and offering a desperate resistance to the enemy. In 1868 the Brazilian fleet bombarded Asunción, and Lopez, spurred to madness by his reverses, arrested and put to torture many of the civil officers of the Government and the foreign diplomatic corps on a charge of conspiracy. A number were executed, among them his own brother and sister, and the lives of some of the members of the American mission were saved only by the timely arrival of an American squadron. Finally, on March 1, 1870, Lopez, who had gradually been driven into the north of Paraguay, was overtaken by the Brazilian cavalry at the Aquidaban River and killed. From Europe Lopez had brought with him a certain Mrs. Lynch as his mistress. She was a woman of great force of character and influenced his career decidedly. After his death she was allowed to remain in Paraguay unmolested.

LOPEZ, Narciso (1799-1851). A Spanish-American soldier and filibuster, born in Venezuela. He entered the Spanish service, and was at one time intrusted with important commands; but, having lost the favor of the Spanish Government, he came to the United States, and in 1849, 1850, and 1851 planned, with the aid of Governor Quitman of Mississippi and other Southerners, to seize Cuba. The first expedition failed because of the interference of the United States authorities. The second landed in Cuba, but was soon driven out. The third and most important was fitted out at New Orleans. Lopez offered the chief command to Jefferson Davis, then a United States Senator, who, however, declined and suggested Robert E. Lee, who likewise declined. Lopez then decided to command the expedition himself, and on August 3, 1851, sailed with about 500 followers on the steamer *Pompero.* The filibusters succeeded in landing on the coast of Cuba about sixty miles from Havana, but were soon attacked by an overwhelming force and killed, captured, or dispersed. A great many of the captives were executed, while others were imprisoned. Lopez himself was taken, and was garroted at Havana, September 1, 1851.

LOPEZ DE AYALA, lō′pāth dā ä-yä′lä, Adelardo (1828-79). A Spanish dramatist and poet, born in the District of Seville, May 1, 1828. He studied law at the University of Seville and then went to Madrid. There, before he was twenty-one years of age, he produced his first drama, *El hombre de estado,* which won praise from the critics, and was performed in 1851. In 1857 he was elected a Deputy to the Cortes from Badajoz. Acquiescing in the revolution of 1868, he accommodated himself also to later changes in the Administration, and was a member of the first Cabinet under Alfonso XII. He died rather suddenly at Madrid, January 30, 1879, being then president of the Congress. In literature Ayala is a figure of the period following that of the nineteenth century Romanticism in Spain, and his work is marked by good taste and temperance of expression. His lyrics are few in number, but are of rather high poetic merit, especially his sonnets. One of these, the *Dame, Señor, la firme voluntad,* was set to music by his friend Arrieta and is sung every year at the services in commemoration of his death. The best of the lyrics is the *Epístola* in octaves, addressed to Arrieta. As a dramatist, Ayala represents a psychological tendency in Spanish letters. This tendency is clear in Ayala's very first play, the *Hombre de estado,* dealing with the tragic story of a personage of the seventeenth century, the statesman and lover Don Rodrigo Calderón. Several minor dramas followed, and for a while the poet gave himself up to the writing of *zarzuelas* or vaudeville plays. In 1854 appeared the *Rioja,* a piece superior in many ways to the *Hombre de estado.* The moral purpose is manifest in the *Tejado de vidrio,* a drama of much merit. A still greater development in art is seen in the *Tanto por ciento* (So Much Per Cent.), a piece merciless in its sociological analysis. Not long after the appearance of this play he was presented with a gold crown paid for by public subscription. Ayala's dramatic fame reached its height with the *Consuelo* (1878). As in the *Tanto por ciento,* he here attacks the element of positivism in our modern life. Consult the edition of his *Obras* (plays and dramas) in the *Colección de escritores castellanos,* 7 vols., lyrics in vol. vii.; Blanco-García, *La literatura española en el siglo XIX., parte segunda* (Madrid, 1891).

LOPEZ DE AYALA, Pedro (1332-1407). A Spanish author, born in 1332. He was of noble origin and held office under Peter the Cruel, Henry II., John I., and Henry III., becoming Grand Chancellor of the Realm in 1398. He was twice made captive by enemies of his country, once by the Black Prince and again at Aljubarrota (1385), and during this second captivity he spent fifteen months in an iron cage at Oviedes. Although he was incessantly active in political life, Ayala none the less seems to have found leisure to carry on literary pursuits. In Spanish literature of the fourteenth century he assumes a distinguished place by reason of his historical labors, his translations, and his verse. As a translator he rendered into Castilian Guido delle Colonne's *Historia Troiana,* parts of Livy's work, and Boccaccio's *De Casibus Virorum Illustrium.* His knowledge of Livy's methods stood him in good stead in his *Crónicas de los reyes de Castilla,* a work showing a tendency to avoid legendary accounts, to sift evidence carefully, and to record personal experience. In his long poem, the *Rimado de Palacio*—a name given to it by others—he incorporates matter of personal experience. The poem is satirical and didactic. Its earlier part is in the *cuaderna via,* the quatrain stanza that was so great a favorite in the thirteenth century didactic and narrative poems; in the second part, the *cuaderna via* structure is broken by the songs, prayers, and laments in various lyric measures, which are scattered here and there throughout. Much interest attaches to the *Rimado de Palacio* because of the pictures which it gives of the customs of the age. In his lyrics Ayala adopted the Provençal manner. Consult the edition of the *Rimado* in vol. lvii. of the *Biblioteca de autores españoles* (Madrid, 1864); that of his *Crónicas* in Llaguno Amírola's *Crónicas españolas* (Madrid, 1879) and in Rosell's *Crónicas de los reyes de Castilla* (Madrid, 1875-78); Floranes, *Vida literaria de P. L. de Ayala*, in the *Colección de documentos inéditos*, vols. xix. and xx.; M. Menéndez y Pelayo, *Antologia de poetas liricos castellanos* (Madrid, 1890 ff., vol. iv.); F. Wolf, *Studien*, etc. (Berlin, 1859).

LOPEZ DE RECALDE, dâ râ-käl′dâ, IÑIGO. The original name of Ignatius of Loyola (q.v.).

LOPEZ DOMINGUEZ, ō-mēn′gâth, JOSÉ (1825—). A Spanish general and politician, born at Marbella, Málaga. He entered the artillery school at the age of sixteen, joined the army as lieutenant in 1850, and became colonel (1860) after service in Italy and Africa. Deputy for Málaga (1860-67), at the dissolution of the Cortes he returned to military service as aide-de-camp to his uncle, Marshal Serrano, through whose influence he became brigadier-general, secretary to the Provisional Government, and field-marshal. For his aid in suppressing the Carlist uprising (1873) he was promoted lieutenant-general (1874), and he took his seat as Deputy once more under Alfonso XII.; was War Minister in 1883, again in 1893-95, and was made a marshal in 1895.

LOPH′IODON (Neo-Lat., from Gk. λόφιον, *lophion*, λοφεῖον, *lopheion*, diminutive of λόφος, *lophos*, crest + ὀδούς, *odous*, tooth). A fossil ungulate mammal of the size of a rhinoceros, found in the lower and middle Eocene deposits of Europe. It is one of the early and generalized types of perissodactyls of odd-toed ungulates, and has some points of resemblance to the tapirs, to the ancestral stock of which it seems to have been indirectly related.

LOPHOBRANCHII, lŏf′ō-brăn′kĭ-ī (Neo-Lat. nom. pl., from Gk. λόφος, *lophos*, crest + βράγχια, *branchia*, gills). An order of osseous fishes, having the ultimate divisions of the gills not pectinated, but arranged in small tufts in pairs along the branchial arches. There is nothing like this in any other fishes, and the order is regarded by Jordan as representing "the extreme of degradation of the line of descent composed of the Hemibranchii and Lophobranchii." The fishes of this order are few, mostly of small size, angular form, and peculiar aspect. The gill-cover is large, and the gill-opening is a small hole. The snout is elongated and tubular. The order includes the sea-horses, pipefishes, etc., forming the suborder Syngnathi and family Syngnathidæ.

LOQUAT, lō′kwăt (from Canton Chin. *lukwat*, from *luk*, a rush, *kiuh*, orange), *Eriobotrya japonica*. A Chinese and Japanese fruit, of the natural order Rosaceæ, introduced in subtropical climates, and becoming popular in California and Florida. The tree or shrub which produces it is an evergreen, which attains a height of 20 or 30 feet, but in cultivation is seldom allowed to exceed 12 feet. It has large oblong wrinkled leaves; fragrant white flowers in terminal woolly panicles; downy oval or pear-shaped yellow fruit about an inch in diameter; and seeds of an agreeable flavor, which they impart to tarts. During the closing years of the nineteenth century several improved varieties were produced in California.

LORAIN, lō-rān′. A city in Lorain County, Ohio, 25 miles west of Cleveland, on Lake Erie, at the mouth of the Black River, and on the Cleveland, Lorain and Wheeling and the New York, Chicago and Saint Louis railroads (Map: Ohio, F 3). It is in a natural-gas region; is the outlet for the central Ohio coal-fields; ships, from a fine harbor, large quantities of coal, lumber, iron ore, and grain; and has important industrial interests, including steel-works, foundries, automatic shovel-works, a ship-building plant, stove-works, brick-works, etc. There is a public library. Lorain was chartered as a city of the second class in 1896, its government being vested in a mayor, elected every two years, a unicameral council, and administrative officials as follows: Police force, appointed by the executive with the council's consent; board of health, elected by the council; and marshal, board of education, and water-works trustees, chosen by popular election. The city owns and operates the water-works. Population, in 1890, 4863; in 1900, 16,028.

LORCA, lōr′kâ (Lat. *Eliocroca*). A city in the Province of Murcia, Spain, 38 miles west of Cartagena, on the right bank of the Sangonera, picturesquely situated on an eminence crowned by a fortified castle commanding a magnificent view (Map: Spain, E 4). It consists of an old Moorish town with narrow streets and half-ruined palaces on the hill-slope, and a modern section in the plain. It is a flourishing town with flour and textile mills, saltpetre and powder works, and mines of sulphur, lead, and silver. In order to retain the surplus waters of the Sangonera for agricultural use in the dry season, an immense reservoir, one of the largest in Europe, has been constructed by means of a dam 800 feet long and 160 feet high. This dam was broken through in 1802, causing a terrible inundation of the valley, attended with great loss of life. Population, in 1887, 58,327; in 1900, 69,910.

LOR′CHA (perhaps a corruption of Port. *lancha*, pinnace). A small sailing vessel common in the Philippines and surrounding islands. It is built like a European or American vessel, and was formerly rigged somewhat like a Chinese junk (q.v.), but many are now rigged like two-masted schooners.

LORD (AS. *hlāford*, from *hlāf*, loaf + *weard*, keeper). A title given in Great Britain to persons noble by birth or by creation. Peers of the realm are so styled; the lay peers are known as lords temporal, the archbishops or bishops who are members of the House of Lords as lords spiritual. By courtesy, the title lord is given to the eldest sons of dukes, marquises, and earls, and to the younger sons of dukes and marquises. Certain officials, e.g. of the Treasury and Admiralty, while collectively called lords in virtue of their office, are not so addressed personally. See

Baron; Duke; Earl; Marquis; Peer; Forms of Address.

LORD. In the English system of landholding, the feudal superior of whom land is held. Thus employed the term is the exact equivalent of 'landlord,' and conveys no implication of social superiority or of class distinction. In the feudal sense, the word signifies one of whom lands are held in fee, and in that sense the King of England is still lord paramount of all the lands in the Kingdom, and there are still many lords of manors, called 'mesne lords,' because standing between the lord paramount and the freehold tenant actually seized of the land. The term is seldom used in the United States except to describe the lessor of land in the modern relation of landlord and tenant (q.v.). See Fee; Estate; Feudalism; Freehold; Manor; Tenure.

LORD, John (1810-94). An American historian and lecturer, born at Portsmouth, N. H. He graduated at Dartmouth in 1833, and then entered the Andover Theological Seminary, where in his second year he wrote a series of lectures on the Dark Ages, which he delivered the next fall during a tour through northern New York. After graduating at Andover he became an agent for the American Peace Society. Later he took a church at New Marlboro, Mass., and then one at Utica, N. Y. But in 1840 he gave up his pastoral duties to become a public lecturer. He published *The Old Roman World* (1867); *Ancient States and Empires* (1869); *Points of History* (1881); and *Beacon Lights of History* (1883-96), which contains in final form much of the material used in his previous works and in his lectures. Dr. Lord was a popular and entertaining historian, and made no pretense to originality or to minute accuracy.

LORD ADVOCATE (of Scotland). See Advocate, Lord.

LORD CHANCELLOR, See Chancellor; Chancery, Court of.

LORD HIGH STEWARD. In England, a peer who is appointed by the Crown to preside over the trial of another peer for treason or felony, or in cases of impeachment. This title was originally applied to one who held the office of Lord High Steward, which was the highest feudal office in the Kingdom, and was hereditary. It was forfeited to the Crown upon the disgrace of Simon de Montfort, who held it at that time, but was regranted to the House of Lancaster, and upon the accession of Henry IV. to the throne it became merged in the Crown. A Lord High Steward is now only appointed when occasion arises. A peer is usually tried by Parliament, but when it is not in session it is necessary for the Crown to appoint a peer to act as Lord High Steward, whose duty it is to summon the other peers, organize his temporary court, and preside at the trial of the accused peer. The Lord High Steward, in such a case, is the sole judge of the law and practice, and the other assembled peers are the judges of fact. When Parliament is in session it is usual, but not necessary, to appoint a Lord High Steward to preside at the trial of such cases, as all the peers are judges of both law and facts. The appointment is by commission and the appointee holds office only during the trial of the particular case over which he is summoned to preside.

LORD HOWE ISLANDS. A group of volcanic islets with an aggregate area of five square miles, situated in the Pacific Ocean, 550 miles northeast of Sydney, and attached administratively to New South Wales. They reach an altitude of nearly 3000 feet, and are very fertile, with a rich Australian flora. Population, in 1891, 55.

LORD KEEPER OF THE GREAT SEAL. See Great Seal; Keeper of the Great Seal.

LORD LIEUTENANT. The chief Crown officer in the counties of Great Britain and Ireland. The office came into existence in the reign of Henry VIII. and grew out of the practice of the Crown appointing prominent persons in each county in times of disorder or danger to muster the male inhabitants who were capable of bearing arms. This prerogative of the Crown was known as issuing 'commissions of array.' The commissioners took the name of lieutenants of the King and corresponded somewhat to the old English earl as military head of the shire, and as such soon overshadowed the sheriff. The latter official gave up his control over the county militia to the Lord Lieutenant and henceforth became a civil officer. The new officer was responsible to the Crown for the efficiency and discipline of the county militia over which he had chief command. The right of the Crown to issue such commissions was denied by the Long Parliament. Their legality was established after the Restoration by a declaratory act. The Lord Lieutenant was the permanent local representative of the Crown, and, on the occasion of an invasion or rebellion, had power to raise the militia, form regiments, troops, and companies, and give commissions to officers. With the growth of a standing army the county militia became less important and at the same time the office of Lord Lieutenant dwindled in power. Finally, in 1871, his authority over the county militia was withdrawn and transferred to other officers appointed by the Secretary of State for War. At the present time he is the principal justice of the peace in the county, is at the head of the county magistracy, and is responsible for the preservation of order and the administration of justice in the county. He is also keeper of the records (*Custos Rotulorum*), appoints the clerk of the peace, and recommends to the Lord Chancellor the appointment and removal of the justices of the peace for the county. He is usually a prominent landowner, generally serves for life, and is under the control of the Home Office.

LORD MAYOR'S DAY. The 9th of November, when the Lord Mayor's show takes place in London. The newly elected Lord Mayor proceeds with much ancient ceremony from the city to the Courts of Justice, where the oath of office is administered. The wooden figures called Gog and Magog, formerly carried at the head of the procession, are now kept in the Guildhall, where the Lord Mayor's banquet is held.

LORD ORDINARY. See Court of Session.

LORDS, House of. As a court, the judicial functions of this august body are almost wholly those of an appellate court. Its claim to original jurisdiction was abandoned in 1670, as the result of a violent dispute between it and the House of Commons, over the famous case of Skinner *vs.* the East India Company. From that time it has received appeals from the Court of Chancery, and it had previously received them from the Court of Exchequer, and from the King's Bench of England, as well as of Ireland. Under the acts of the union with Scotland, the House of Lords became the final court of appeal from the highest Scotch tribunals. The Judicature Act of 1873 threatened an interruption of the judicial functions of the Lords, but before the time appointed for this event arrived, another statute provided for the maintenance of the House in its former position. As a court of last resort, the House of Lords is a small body. It consists of the law lords only. These are the Lord Chancellor; the peers who have previously held that office; those who are holding or who have held the Lord Chancellorship of Ireland, or the office of paid judge of the judicial committee of the Privy Council, or of judge of one of his Majesty's superior courts, and of the Lords of Appeal in Ordinary. Consult the authorities referred to under COURT; CONSTITUTIONAL LAW. See PARLIAMENT; JUDICATURE ACTS.

LORD'S DAY. See SUNDAY.

LORDS JUSTICES OF APPEAL. The justices constituting the Court of Appeal, the appellate division of the Supreme Court of Judicature in England. The title was created by an amendment to the Judicature Act in 1877, which provided that the ordinary judges of the Court of Appeal should bear the above title. See JUDICATURE ACTS.

LORDS OF APPEAL IN ORDINARY. Certain members of the judicial committee of the Privy Council in England, who are appointed by the Crown for the purpose of assisting that body in the hearing of appeals. The office was created by the Appellate Jurisdiction Act of 1876, 39 and 40 Vict., ch. 59. To be eligible to such appointment a person must have occupied one of the high judicial offices of the Supreme Court of Judicature, or have been a practicing barrister in England or Scotland for not less than fifteen years. Such an appointee ranks as baron, with the above title, and is entitled to sit and vote in the House of Lords while he continues in office. His appointment is for life, or during good behavior, but he may be removed by the joint action of both Houses of Parliament. See JUDICATURE ACTS; PRIVY COUNCIL.

LORDS OF THE ISLES. See ISLES, LORDS OF THE.

LORD'S PRAYER. The model prayer taught to His disciples by Jesus (Matt. vi. 9-13; Luke xi. 1-4). The form and the occasion of the Lord's Prayer are reported differently in the two Gospels which contain it. In Matthew it is found in the Sermon on the Mount. According to Luke it was given later in answer to a request of one of the disciples. The majority of scholars incline to the opinion that Luke's account is more historical, though some, Plummer, for example, think that Jesus may well have taught this prayer on two separate occasions. If the prayer was given twice, it was not expressed both times in exactly the same language. Luke's version, according to the best manuscripts, differs from Matthew's (1) in being shorter and (2) in other minor particulars. When the two are placed side by side the differences are noticeable, thus:

MATTHEW	LUKE
Our Father	Father,
Who art in heaven,	
Hallowed be thy name;	Hallowed be thy name,
Thy kingdom come;	Thy kingdom come;
Thy will be done,	
As in heaven so upon earth;	
Give us to-day	Give us day by day
Our daily bread;	Our daily bread;
And forgive us our debts,	And forgive us our sins,
As we also have forgiven our debtors;	For we also forgive every one indebted to us;
And bring us not into temptation,	And bring us not into temptation.
But deliver us from the evil [one?].	

(The best MSS. omit the doxology in both Gospels.)

If one of the two forms is not original, it is probable that the longer is most like what Jesus taught. The earliest witness to the prayer outside of the New Testament, the *Teaching of the Twelve Apostles*, of the first or early in the second century, agrees with Matthew, except that it has a doxology attached.

It is altogether likely that Jesus taught the prayer in Aramaic, the mother tongue of Himself and the disciples. The Greek, as we have it in the Gospels, is then a translation made some time after the prayer in its original Aramaic had become widely known and read. Both the longer and the shorter forms may have been in circulation, one of which was reported to Luke; the other and more widely known was embodied in the collection of *Logia* which underlies our Gospel of Matthew (q.v.). This is more satisfactory than to suppose that Luke purposely shortened the prayer.

Two phrases demand special mention. The word translated 'daily' is *ἐπιούσιος*, a rare word, apparently coined by the first translators of the prayer from the original Aramaic. Its exact meaning is disputed. According to analogy it should come from *ἐπί* + *ἰέναι*, and mean 'coming,' i.e. 'for the morrow' (cf. *ἡ ἐπιοῦσα*, in Acts vii. 26, etc.). But many, following Origen, prefer to derive it from *ἐπί* and the substantive or abstract *εἶναι* (to be). On the basis of the Greek alone no satisfactory conclusion can be reached. The old Latin version translated the term by *quotidianum*, i.e. daily, which the Vulgate retained in Luke, but changed to *supersubstantialem* in Matthew. *Quotidianum* is evidence that in very ancient times the idea in *ἐπιούσιος* was thought to be temporal, not qualitative. The old Syriac rendering, 'the continual bread of the day,' reflects the same conviction. The later Syriac version, like the later Latin, changed the translation to 'necessary.' Jerome says that the old Gospel of the Hebrews read *mahar*, that is, 'to-morrow' (bread of or for to-morrow). It is, therefore, probable that Jesus (speaking Aramaic) said the equivalent of 'bread for the coming day,' and that the first translators rendered this into Greek by *ἐπιούσιος*, a word coined under the influence of *ἡ ἐπιοῦσα*, to-morrow. So understood, the teaching is that we should, in simple faith, ask God to supply our daily needs (bread), yet not be over-anxious about such things (cf. Matt. vi. 34).

The other term is 'the evil' in the last petition. The point in dispute is whether the word (*τοῦ*) *πονηροῦ* should be considered masculine (the evil one) or neuter (evil). The usage of the LXX. and the New Testament is not conclusive, but may be said, on the whole, to favor the masculine. The most ancient versions also appear to have taken this view, which is the one adopted in the Revised Version.

The extent to which this prayer was original with Jesus has been keenly disputed. It was once claimed that He drew all its material from current Jewish prayers. This was met by a counter-denial of as sweeping a character. The truth is that some of the phrases, e.g. 'Our Father' (in a more restricted sense), and some of its ideas were already at hand. Jesus' originality lay not only in the new elements He contributed, but in what He omitted (of the ordinary prayer-forms current in His day) and in the remarkable arrangement of the whole.

Jesus did not intend this prayer to be used as a fixed or liturgical form, but as a model suggestive of what true prayer should be. But inevitably, and in very early time, it came to be so used. There are hints that this was the case even in New Testament times. The earliest Church manual, the *Didache* (see Teaching of the Twelve Apostles) (c.100 A.D.), includes it, directing that it be said thrice each day. The most ancient liturgies, with one exception, contain it, giving it a place in the eucharistic services between the consecration of the elements and the communion. The liturgical use led to the addition of the doxology, the earliest known form of which (in the *Didache*) is "For Thine is the power and the glory forever." The (longer) doxology in common use is not found joined to the prayer in any writer before Chrysostom.

Bibliography. Of the very large literature, the following works are of special importance. Many of the Fathers, e.g. Tertullian, Origen, Chrysostom, Augustine, and Jerome, wrote on the Lord's Prayer. Extended expositions of its teaching are given in the great catechisms such as Luther's, the Heidelberg, the Westminster, the catechism of the Eastern Church, and others. Modern scholarly discussions are offered by Tholuck, *Bergpredigt* (Hamburg, 1833); Kamphausen, *Das Gebet des Herrn* (Elberfeld, 1866); Wendt, *The Teaching of Jesus* (Eng. trans., New York, 1892); Weiss, *The Life of Jesus* (Eng. trans., Edinburgh, 1883-84); Lightfoot, *On a Fresh Revision of the New Testament* (London, 1881); Cook, *Deliver Us from Evil, A Letter to the Bishop of London* (London, 1881); id., *A Second Letter*, etc. (London, 1882); Chase, *The Lord's Prayer in the Early Church, in Texts and Studies*, vol. i. (Cambridge, 1891); Jannaris, "The English Version of the Lord's Prayer," in the *Contemporary Review* (1894); Plummer, in the *Hastings Dictionary of the Bible*, vol. iii. (New York, 1900); Nestle, in *Encyclopædia Biblica*, vol. iii. (London, 1902).

LORD'S SUPPER. A term widely applied to the principal sacrament of the Christian Church. This name, however, appears originally to have referred to the *agape* or love-feast (see Agapæ) which was closely connected, if not combined, with the celebration of the sacrament in the early Church, and was probably used by Saint Paul in this sense in I. Cor. xi. 20; but it can hardly be said to have been known in the earliest times as a name for the sacrament itself. The commonest designation then was eucharist or thanksgiving (see Luke xxii. 19; I. Cor. xiv. 16; I. Tim. ii. 1). It was employed by Ignatius in his epistles (A.D. 107), by Irenæus, who says that the bread after consecration "is no longer common bread, but eucharist," and by Justin Martyr (A.D. 140). Another term employed in the English and American prayer-books is Holy Communion, from the Greek *κοινωνία* (I. Cor. x. 16, where it means communication or impartation). The designation 'Lord's Supper,' however, is in very general use at the present time, because of its appropriateness in taking the mind back to the time and place of the institution.

As described in the synoptic Gospels and in I. Cor. xi. 23-27, the sacrament was instituted by Christ on the eve of His passion, at the last supper or paschal feast which He kept with the Twelve. During the progress of the meal He transformed the Jewish Passover into the New Passover, the Holy Eucharist of the Christian Church. There is no mention by the evangelists of the eating of a lamb, but we are told that the Saviour took one of the small loaves or cakes of unleavened bread and broke it, saying, "Take, eat; this is My body which is given for you; this do (or offer) in remembrance (or for a memorial) of Me;" and that later He took the cup and said: "Drink ye all of this, for this is My blood of the new testament (or covenant) which is shed for many for the remission of sins." For a discussion of the New Testament notices concerning the institution, see the article Gospel, paragraph *The Lord's Supper*.

As to its origin, then, the great sacrament was wholly Jewish. Any other suggestion, according to a most recent authority, is quite unhistorical. "It was developed out of the rites and associations of the paschal sacrifice and meal." As the Jewish Passover was a memorial of the deliverance of God's ancient people from the bondage of Egypt and of their covenant relationship with Him, so the Christian sacrament of the Lord's Supper became a solemn memorial of man's emancipation from the thraldom of sin and his place in the new covenant of the Saviour's blood.

But the Passover of the Jews, with their other sacrificial rites, was akin to religious customs which are universal, and the Christian Passover may likewise be said to contain elements which are common to all religions. Sacramental worship, in some form or other, is the almost universal heritage of mankind. It is the divine consecration of a human instinct. It is the embodiment and expression of a universal idea—the union of the outward and inward, the visible and invisible, the human and the divine, in some concrete form.

Some theologians have traced an analogy between the Christian sacraments and the Greek mysteries. They have even discussed the question whether the ideas which are most characteristic of the mystery-worship were directly borrowed by the Church, or arose spontaneously in the latter under the same influences which produced them in the former. Others, again, have repudiated any connection between the eucharistic feast and the 'sombre, cruel, and revolting ceremonies' of the heathen forms of worship, and Justin Martyr says that in the mysteries of Mithra "the evil spirits have instituted by imitation a rite similar to the Christian eucharist."

Clearly the institution and establishment of the sacrament marks an epoch in both sacred and profane history. When the sacrifice of sacrifices had been offered upon the cross and presented in Heaven by Him who was both victim and priest, the whole system of animal sacrifices passed away. By A.D. 112, as we learn from Pliny's letter to Trajan, a practice consecrated to the Jews by the associations of centuries and observed by the Greeks and Romans from remote antiquity had disappeared. Sacrificial terms remained, but they grouped themselves around a remarkable and significant rite. The Lord's Supper was spoken of as a *προσφορά* or oblation, as a *θυσία* or sacrifice, and as an *ἀνάμνησις* or memorial. The term *hostia*, victim, host, crystallized the same idea for later times.

Viewed objectively, it early became the central act of worship of the Christian Church. The feast was kept every Lord's Day, or even more frequently. The first converts continued steadfastly not only "in the Apostles' doctrine and fellowship," but also in "the breaking of bread and in the prayers" (Acts ii. 42). Around the Lord's Supper gathered and grew the ancient liturgies of the Christian faith. It proclaimed in unmistakable imagery the Lord's death, and, by implication, His resurrection and ascension. It attracted to it all that was richest and best in symbolic ceremony and holy song.

Subjectively, it became the Church's greatest and most precious means of grace. It was a new covenant, and, like the old, was a feast upon a sacrifice. "The one was on the lamb, the other on the Lamb of God. The one true, the other true. The one carnally true, the other spiritually, and therefore even more true." As in the physical life the waste of bodily tissues is repaired by food, so in the spiritual life the waste in the finer tissues of man's higher nature was said to be repaired by the body and blood of Christ, as "verily and indeed taken and received by the faithful" in the Lord's Supper. The spiritual nourishment—the divine element—in the sacrament has been almost universally understood to be, in some real sense, the body and blood of the Saviour, and by receiving it Christians have from the beginning believed themselves to be united to God and in fellowship to one another in Jesus Christ.

This is made plain by Justin Martyr. After giving a detailed account of the service as it was celebrated in his day, including the distribution, among those present, of the loaf and the wine and water, he says: "And this food is called among us eucharist, and no one is allowed to take it unless he believes that what we teach is true, and has been washed in the laver for the remission of sins and for regeneration, and is living as Christ enjoined. For we do not receive these things as common bread or common drink, but just as Jesus Christ our Saviour, by the word of God made flesh, had both flesh and blood for our salvation, so we have been taught that the food over which thanks have been given by the word of prayer which comes from Him—that food from which our flesh and blood are by assimilation nourished—is both the flesh and the blood of that Jesus who was made flesh."

The greatest devotional unanimity on the subject prevailed for nearly eleven centuries. Then followed eight centuries or more of uninterrupted controversy. "That presence," says Milman, "had as yet, in the eleventh century, been unapproached by profane or searching controversy, had been undefined by canon, neither agitated before council nor determined by Pope."

The early Fathers were not trained theologians. They were not careful and precise in their language regarding the Lord's Supper. But that the entire primitive Church believed in the real presence of Christ in the sacrament there appears to be no doubt. The schoolmen, on the other hand, were philosophers. They aspired to reduce the Church's body of doctrine to an intellectual system. They sought to show that the doctrine of the Eucharist involved no rational antagonism. Speculation, too, was rife; and it naturally found expression in the language of the dominant or Aristotelian school of philosophy. The result was the metaphysical doctrine of transubstantiation. The term was first officially used by the Latin Church at the Lateran Council of 1215, and the doctrine became her recognized and authoritative teaching, so defined by the action of the Council of Trent (A.D. 1551).

The subtle distinctions of theology were unknown to the common people, and the Reformers found it easy to persuade many that they were substituting for this doctrine a more primitive and spiritual one. But they met the same difficulties as the schoolmen, and found it impossible to explain the mystery of the sacrament. The doctrine of transubstantiation, as popularly understood, at any rate, annihilated the natural. The bread and wine were, to all intents and purposes, no longer present. But Zwinglianism destroyed the supernatural, and made the Lord's Supper an empty symbol or bare memorial of a past event. It found no place for the *res sacramenti*, the very heart of the sacrament—the 'inward and spiritual grace' so inseparable from the *sacramentum* or 'outward and visible sign.'

Another view, commonly but erroneously called the Lutheran, was known as consubstantiation. The word appears to have been coined by the opponents of Lutheranism and was derived from an expression of Luther's in his letter to Henry VIII. It represents the substance of the body and blood of Christ as coexisting in union with the substance of bread and wine, just as iron and fire are united in a bar of heated iron.

The opinion which sought to establish a 'via media' between transubstantiation and consubstantiation, on the one hand, and Zwinglianism on the other hand, is known as the Receptionist theory. This recognized a presence and insisted on its being spiritual, as opposed to material. But, in the last analysis, it must be admitted that this presence, according to Calvin and his followers, was not in the sacrament itself, and by virtue of the act of consecration, but in the heart of the recipient and by virtue of an act of faith on his part. This view ignored the *res sacramenti*, as did Zwingli's, but preserved and cherished the *virtus* or *beneficia*, and hence has been designated by some writers as 'Virtualism.'

Another view, and one held largely in the Anglican communion, is known as the Objective Real Presence. The adjective has been inserted in the definition as a safeguard against virtualism. Dr. Pusey says: "Finding that the words Real Presence were often understood of what is in fact a real absence, we added the word 'objective,' not as wishing to obtrude on others a term of modern philosophy, but to express that the life-giving body, the *res sacramenti*, is, by virtue of the consecration, present without us to be received by us, in the words of the Fathers, 'for us to lay up Christ in ourselves, and place the Saviour in our breasts.'" The Presence he calls "sacramental, supernatural, mystical, ineffable, as opposed not to what is real, but to what is natural."

The advocates of this view of the Holy Communion contend that it not only embodies the teaching of the early and undivided Church, but that it does so in language calculated to preserve the sacrament from the several forms of error with which it has unhappily been associated. They assert also that it stands the test of the Chalcedonian formula as summed up by the judicious Hooker. As in the Incarnation our Lord was truly (ἀληθῶς) divine and perfectly (τελέως) human, and as the two natures were, in His one Person, united inseparably (ἀδιαιρέτως) but unconfusedly (ἀσυγχύτως), so in the sacrament of His body and blood there is the supernatural presence 'under the form of' the natural bread and wine, and the two are united inseparably, but unconfusedly. The natural is not merged and lost in the supernatural. The supernatural is not overlooked or ignored. The two are neither cut asunder nor fused together. There is neither a separation nor an amalgamation.

The assertion made recently by Bishop Gore that the spiritual presence is for a purpose—'in order to be eaten,' as he contends the prayers of consecration in the old liturgies indicate—may possibly conduce toward a harmonizing of discordant views. (For the development of the service used in connection with the sacrament, see LITURGY; for details relating to communion, see SACRAMENTS; COMMUNION IN BOTH KINDS; for fuller exposition of the Roman Catholic teaching, see MASS; TRANSUBSTANTIATION.) As to the materials used, it may be said that bread and wine made from the juice of the grape have always been required, the latter mixed with water in the ancient historic churches; though the sects of the Encratites and Elkesaites substituted water for the wine, and some extreme advocates of total abstinence in modern times have suggested the use of unfermented grape-juice. The Christians of Saint Thomas in India and the Syrian Christians mixed oil and salt with the bread. Unleavened bread has been used in the Western Church from an early date, probably by analogy with the usage of the Passover; the Eastern Church still employs leavened bread. As to the frequency of the observance of the rite, it may be said that it is celebrated very frequently, if not daily, in the Roman Catholic and Eastern churches; in the Anglican communion, the result of the Oxford Movement has been to increase the frequency so that it is generally celebrated bimonthly or weekly, and in many places daily; the Protestant churches have usually reduced it to once a month, or quarter, or a year.

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LORD ULLIN'S DAUGHTER. A Highland ballad written by Thomas Campbell (1809). It was a favorite in the early part of the nineteenth century, and was set to music by George Thomson.

LORELEI, lō′re-lī, or **LURLEI**, lo͞or′lī. A steep rock on the right bank of the Rhine, about 430 feet high, a little above Sankt Goar, formerly dangerous to navigation. It is celebrated for its echo, which has given rise to the legend of the siren, a favorite theme with the German poets and exquisitely treated by Heine. The rock is pierced by a railway tunnel.

LORENZ, lō′rĕnts, ADOLF (1854—). An Austrian orthopædic surgeon. He graduated from the University of Vienna in 1880 and obtained the post of assistant to Professor Albert, who then occupied the chair of surgery at the university. Lorenz had intended to become a general surgeon. Professor Albert advised him to take up orthopædic surgery, which was then comparatively new in Vienna, and which consisted mainly in exercise and bracing. The operation which made him famous—the so-called 'bloodless' reduction of congenital dislocation of the hip-joint—was developed only after years of experiment with other methods. Beginning with the 'open' method of Haffa, he modified it by stretching and parting, instead of cutting the muscles—the Haffa-Lorenz operation—and finally in 1892 conceived the idea of reducing the hip by manipulation alone. In 1895 he demonstrated the method before the medical congress at Berlin, and it found general acceptance. In 1902 he visited the United States and England; he demonstrated his methods in both countries. He devised several other orthopædic operations besides that for the reduction of hip dislocations, notably one for the straightening of club-foot, and has invented several instruments. His more important works are: *Ueber die unblutigchirurgische Behandlung der angeborenen Hüftverrenkung mittels der functionellen Belastungsmethode* (1896); *Orthopädie der Hüftgelenks-Kontrakturen und Ankylosen* (1889); *Das instrumentelle kombinierte Redressement der Hüftgelenks-Kontrakturen* (1898); and *Ueber die Heilung der angeborenen Hüftgelenks-Verrenkung durch unblutige Einrenkung und functionelle Belastung* (1900).

LORENZ, Ottokar (1832-1904). An Austrian historian, born in Iglau, Moravia. He was educated in Vienna, and was appointed professor of history in the university there in 1860. In 1857 he received a Government appointment in the Department of Secret Archives, which he was compelled to relinquish in 1865 on account of indiscreet disclosures. In 1885 he was called to the University of Jena. His works include: *Deutsche Geschichte im dreizehnten und vierzehnten Jahrhundert* (1863-67); *Deutschlands Geschichtsquellen im Mittelalter seit der Mitte des dreizehnten Jahrhunderts* (3d ed. 1886-87); *Papstwahl und Kaiserthum* (1874); and *Goethes politische Lehrjahre* (1893).

LORENZETTI, lō'rĕn-zĕt'tē, Ambrogio (?-1348?). An Italian painter of the Sienese school, born at Siena. He and his brother, Pietro, are the only painters of the time who can compare with Giotto. Ambrogio's earliest works were for the churches of Siena, and his masterpiece, the allegorical frescoes executed between 1338 and 1340, is in the Palazzo Pubblico, of the same city. Afterwards he worked in Florence, and a picture by him is in the Academy there. Several of the frescoes in the Campo Santo at Pisa, formerly attributed to Orcagna, were done by him and his brother.—Pietro (?-1348?) is known to have been painting in 1305, and Vasari refers to him as 'Pietro Laurati, a pupil of Giotto.' His early works in Siena show a progress in art equaled by only Giotto himself. He worked with his brother on the now destroyed frescoes on the front of the hospital at Siena, and in the Campo Santo, at Pisa. Among other works by him are the frescoes in the lower Church of Saint Francis at Assisi, and easel pictures in Siena, Florence, and Arezzo. Pietro's son, Lorenzo, was a sculptor, of whom little is known except that he worked in Pisa.

LORENZO, lô-rĕn'zô, Don (c.1370-c.1425). An Italian painter and Camaldolese monk, also called Il Monaco. He was born probably in Florence. He belongs to the Florentine school, and is usually called a pupil of Agnolo Gaddi. The only signed work by him, a triptych once in the abbey of his Order at Ceretto, near Certaldo, is now in the Uffizi Gallery. It represents the "Coronation of the Virgin," and contains many figures. It is dated 1413. Its manner is not unlike Gaddi's. The drawing is faulty, but it is elaborately finished, and has considerable religious sentiment, while the color is pleasing. Other works identified as his are: a "Madonna" (1404), at Empoli; a "Madonna and Saints" (1410), in the Church of Monte Oliveto, Florence; and an "Adoration of the Kings," in the Uffizi Gallery, Florence.

LORENZO DE' MEDICI, dā mā'dē-chē. See Medici.

LORENZO DI PIETRO, dē pyā'trô (called Il Vecchietta) (c.1412-80). An Italian painter, architect, sculptor, and goldsmith, born at Castiglione di Valdorcia. He is one of the most important painters of the later Sienese school, and often exhibits an impressive seriousness of expression, especially in such works as the altarpiece, in the Cathedral at Pienza, representing the Assumption, which is considered his masterpiece. But, like all the painters of his time, his works are stiffly composed and overladen with ornamentation, and his figures are angular. There are frescoes by him in the Palazzo Pubblico, the Hospital, and the Baptistery, in Siena; and a Madonna in the gallery of the same city, and in the Uffizi at Florence. He is less known in the other branches of his art.

LORENZO MARQUES, lô-rāN'zô mär'kĕsh. See Lourenço Marques.

LORENZO STECCHETTI, lô-rĕn'zô stĕ-kĕt'tē. A pseudonym of the Italian poet Olindo Guerrini (q.v.).

LORETA, lô-rā'tȧ, Pietro, Count (1831-89). An Italian surgeon, born in Ravenna, and educated at Bologna. In 1861 he was made anatomical prosector to Calori at Bologna; in 1865 he took charge of the surgical clinic, and in 1868 became professor of surgery in the University of Bologna. A famous surgeon, he is best known for his device of dilatation of the pylorus for cancer. Loreta wrote: *Nuovo metodo di cistatomia perineale; Nuovo metodo di cura degli aneurismi; La divulsione digitale del piloro; La divulsione instrumentale del cardia;* and *La resezione del fegato.*

LORETO, lô-rā'tô. A city of the Province of Ancona, Italy, 15 miles by rail southeast of Ancona (Map: Italy, H 4). It is one of the great Catholic pilgrimage resorts. Its chief interest lies in the possession of the *Santa Casa,* reputed to be the house in which Christ lived at Nazareth with His mother and Joseph. The large, fine church inclosing it is near the centre of the town, in a square which contains also the Governor's palace, designed by Bramante, and a fine bronze statue of Sixtus V. The house itself is plain, of stone, and very small. The whole precinct is rich in decorations of many varieties by great artists. Population, in 1901 (commune), 7845. The town has been the see of a bishop since 1586. The legend as to the Holy House asserts that in 1291, after the Holy Land was abandoned to the Saracens, the house was carried by angels to Raunitza on the Dalmatian coast, and as mysteriously transferred to its present site three years later.

LORETO. A department of Peru, occupying the northeastern part of the Republic, and bounded on the north by Ecuador and the territory claimed by Ecuador and Colombia, on the east by Brazil and Bolivia, on the south by the Peruvian departments of Cuzco and Huánuco, and on the west by the departments of Amazonas and Libertad. The boundaries are mostly imperfectly defined, and the area can hardly be estimated with any degree of accuracy. Official estimates give it as 288,456 square miles. The western part adjoining the settled portion of the Republic belongs to the region of the Andes. The eastern part lying between the Andes and the Javari River, which forms the eastern boundary, is very little known. It is traversed from south to north by the two tributaries of the Marañon, the Huallaga, and the Ucayali, and is supposed to be mostly flat, with occasional ranges of hills. The greater part of the department is covered with thick forests and the climate is hot and unhealthful. The chief products are rubber and salt; the river beds are supposed to contain rich gold deposits. The population is estimated at over 100,000, consisting mostly of civilized Indians inhabiting the northwestern portions. The eastern forest regions are inhabited only by Indians, whose numbers are unknown. The capital is Moyobamba (q.v.).

LORETO, Our Lady of. A wooden statue of the Virgin in the Santa Casa (q.v.) at Loreto, Italy. It is reputed to be the work of Saint Luke. The image was removed to France in 1797 and was returned in 1803.

LORETO, Sisters of, or 'Friends of Mary at the Foot of the Cross.' A Roman Catholic sisterhood, founded in 1812 by Charles Nerinckx, a Flemish missionary priest (1761-1824), in Marion County, Ky. The Order is devoted to the cause of education and the care of destitute orphans, and has many establishments in the Western States. It numbered (1901) 575 sisters, 40 novices, and 2 postulants, and had 56 academies and parochial schools, with 8000 pupils.

LORETTE, ANCIENNE, lô'rĕt' äN'syĕn'. A Canadian village, seven miles west-southwest of Quebec (Map: Quebec, E 4). It contains extensive works in connection with Lake Charles, the source of Quebec's water-supply. Population estimated at 1500. It was the last refuge of the Huron Indians after their defeat at Lake Huron in 1650, and some 300 Christianized descendants occupy Indian or Jeune Lorette, three miles north, to which their ancestors were removed in 1697. Their village contains a reproduction of the famous chapel and statue of the Virgin at Loreto, Italy, and is much frequented for its ethnological interest, the fine view it commands of Quebec, and the picturesque falls of Lorette.

LORGUES, lôrg, Antoine François Félix Roselly de. See Roselly de Lorgues.

LORIA, lō'rē-ȧ, Achille (1857—). An Italian economist, born at Mantua. After completing a course of legal study at Bologna he studied economics at Rome, Berlin, and London. In 1881 he was appointed professor extraordinary of economics at Siena, and in 1891 professor of economics at the University of Padua. Loria is a brilliant economist of that school which seeks to explain the essential facts of history by reference to economic conditions. In his view, a study of the forms of land tenure gives a key to the problems of progress. His sympathies are with the Socialists, but, unlike them, he endeavors to show that natural forces will eventually give to the laborer his just reward. His principal works are: *La rendita fondiaria e la sua elisione naturale* (1880); *La legge di popolazione ed il sistemà sociale* (1882); *La teoria del valore negli economisti italiani* (1882); *Carlo Darwin e l'economia politica* (1884); *La teoria economica della costituzione politica* (1886); *Analisi della proprietà capitalista* (1889); *Studii sul valore della moneta* (1891); *La terra ed il sistema sociale* (1892); *La costituzione economica odierna* (1889); and *Il capitalismo e la scienza* (1901).

LOR'ICA'TA (Neo-Lat. nom. pl., from Lat. *loricatus*, p.p. of *loricare*, to clothe in mail, from *lorica*, coat of mail, from *lorum*, thong), or Loricati. A term which has been used in many departments and periods of zoölogy to express the prevailing scaled character of a group. Among mammals it has designated the armadillos. Among reptiles it is synonymous with Crocodilia; and in ichthyology it has been applied both to the ganoid fishes and to 'mail-checked' cottoids, and is still used for the latter by Jordan and Evermann. Similarly the term has been applied in conchology to the mail-shells or chitons, and to sundry crustaceans, worms, and infusorians which have loricate coverings.

LORIENT, lō'rē-äN', or **L'ORIENT.** A first-class fortress and one of the most important naval ports of France, situated in the Department of Morbihan, on the Scorff, near its confluence with the Blavet, 104 miles by rail southeast of Brest (Map: France, C 4). It is a well-built town, without any architectural interest, however. The extensive and well-protected harbor is divided into the commercial and the naval harbor. The former is equipped with a dry and a floating dock and is accessible to vessels of the heaviest draught. The naval dockyards occupy a very large area and inclose an arsenal, a number of wharves, and numerous machine-shops, boiler-works, rope-factories, etc. The town has a number of private iron-foundries, engine-works, tanneries, chemical-works, etc. The fisheries of Lorient are of great value, large quantities of sardines being exported. Among the educational institutions of the town are a lycée, a naval school, a library, a museum, and an observatory. Lorient was founded by the French East Indies Company in 1666, and became a military port in 1690. The shipbuilding establishments were bought by the State after the collapse of the company in 1782. Population, in 1891, 42,116; in 1901, 44,640.

LOR'IKEET, or **LORIQUET.** A diminutive of 'lory,' applied with little or no discrimination to any of the smaller species. See Lory.

LORIMER (OF. *lorimier*, *lormier*, from *lorain*, *lorein*, bridle, from Lat. *lorum*, thong). A harness-maker, or a maker of bits, spurs, stirrup-irons, metal mountings for saddles and bridles, and generally of all articles of horse-furniture. In London, the lorimers, who had previously formed part of another guild, were incorporated by letters patent in 1712; in the Scottish burghs they have been included as a branch of the corporation of hammermen.

LORIMER, lŏr'ĭ-mẽr, George Claude (1838-1904). An American Baptist minister. He was born in Scotland, and attended school in Edinburgh. His step-father, by whom he was brought up, being connected with theatres, he was associated with them for several years. In 1855 he came to the United States, and shortly afterwards joined the Baptist Church and abandoned the stage. He was graduated at Georgetown College, Kentucky; was ordained in 1859, and took charge of a church at Paducah, Ky., in 1860. He afterwards served as pastor of the Walnut Street Church, Louisville, Ky.; at Albany, N.Y., whither he removed in 1868;

Shawmut Avenue Church and Tremont Temple, Boston (1870-79); Immanuel Church, Chicago (1879); Tremont Temple, Boston (1891); and Madison Avenue Baptist Church, New York (1902). He was for several years associate editor of the Baptist weekly journal, *The Watchman*, published at Boston. He edited *The People's Bible History Prepared in the Light of Recent Investigations* (1895); and among other works published: *Under the Evergreens* (1872); *The Great Conflict* (1876); *Studies in Social Life* (1886); *The Argument for Christianity* (1894); *Messages of To-Day to the Men of To-Morrow* (1897), etc.

LORIMER, Peter (1812-79). An English Presbyterian. He was born in Edinburgh, and educated in that city, but from 1836 was connected with the ministry of the English Presbyterian Church; he was professor of theology in its college, in London (1844-78), and became principal in 1878. He deserves mention for his important monograph, *John Knox and the Church of England* (London, 1878), and his translation of Lechter's *John Wyclif and His English Precursors* (2 vols., London, 1878).

LORING, lō′rĭng, Charles Greeley (1794-1868). An American lawyer, born in Beverly, Mass., and educated at Harvard (class of 1812). He practiced law in Boston, became actuary of the Massachusetts Hospital Life Insurance Company in 1857, and in 1862 entered the State Senate. He wrote *Neutral Relations Between the United States and England* (1863) and a *Life of William Sturgis* (1864). He was a man of great oratorical ability and a prominent member of the Massachusetts Historical Society.—His son, Charles Greeley Loring (1828-1902), was born in Boston, graduated at Harvard in 1848, served through the Civil War, and in 1865 retired with the rank of brevet major, U. S. V. In 1873 he became a trustee, and in 1876 executive officer of the American Museum of Fine Arts.

LORING, Ellis Gray (1803-58). An American lawyer. He was born in Boston, prepared for college at the Boston Latin School, and entered Harvard in 1819, but left before graduation to study law. He was admitted to practice in 1827, and rose rapidly to a foremost place at the Boston bar. He openly advocated abolition, in 1833 was one of the twelve founders of the first Anti-Slavery Society in Boston, and the author of its constitution. He offered his legal services freely in defense of fugitive slaves, thereby practically ostracizing himself from the circle of society in which he had been reared. His defense of the slave child 'Med' before the Massachusetts Supreme Court was his most notable case. In this case he was opposed by Benjamin R. Curtis (q.v.), but succeeded in obtaining a decision of the court that every slave brought into Massachusetts was by that fact legally free, and presented his argument with such force and eloquence that Curtis himself, after the trial, acknowledged that he had been completely won to Loring's view. Many of his anti-slavery addresses were published.

LORING, George Bailey (1817-91). An American agriculturist. He was born in Massachusetts, graduated at Harvard in 1838, and at the Harvard Medical School in 1842, after which for several years he was physician at the Chelsea (Mass.) marine hospital. From 1850 on he devoted himself extensively to the study of scientific agriculture. Residing in Salem, he several times represented that city in both branches of the Legislature. He was also for many years president of the Massachusetts Agricultural Society, was a member of the Republican National Convention in 1868 and 1872, and enjoyed a high reputation as a public speaker. He was a member of Congress from the Essex District in 1877-81, United States Commissioner of Agriculture in 1881-85, and Minister to Portugal in 1889-90. His writings include several public addresses, and *The Farm-yard Club of Jotham* (1876).

LORING, William Wing (1818-86). An American soldier, born in North Carolina. He was early taken by his parents to Florida, and at the age of fourteen enlisted in a volunteer company which took part in the Seminole War, attaining the rank of lieutenant at the end of two years of active service. Later he studied for a time at Georgetown (D. C.) College, and then served as a volunteer in the war for Texan independence. Having returned to Florida, he was a member of the Territorial Legislature from 1839 to 1842. At the outbreak of the Mexican War he became captain in a regiment of mounted rifles, and later served with distinction under both General Taylor and General Scott. Appointed major, he was assigned in 1849 to command the troops in the Department of Oregon, became a lieutenant-colonel in 1851, and served against the Indians in the Rio Grande country until 1856, when he was promoted to be colonel. In 1857-58 he served under Albert Sidney Johnston at the time of the Mormon troubles in Utah. He then traveled in Europe for a year, made a study of Continental military systems, and on his return was appointed to command the Department of New Mexico. He was strongly opposed to the secession movement, but was a believer in the doctrine of States' rights, and on the withdrawal of Florida from the Union he entered the Confederate service, in which he was at once appointed brigadier-general. He became a major-general in February, 1862; served with distinction in West Virginia, and as a corps commander in Georgia, Mississippi, and Tennessee; took part in the Vicksburg and Atlanta campaigns, and in the battles of Franklin and Nashville, in 1864, where he was second in command to Gen. John B. Hood. Later he served under Gen. Joseph E. Johnston in the Carolinas, surrendering with him to Sherman in April, 1865. After several years in the banking business in New York City, he accepted in 1869 a commission from Ismail Pasha, the Khedive of Egypt, to reorganize his army. He remained in Egypt for ten years, accomplished his task with great success, and returned to America in 1879 with the rank of general of division. He published an account of his Egyptian service under the title of *A Confederate Soldier in Egypt* (New York, 1883).

LORINSER, lō-rĭn′zẽr, Karl Ignaz (1796-1853). A German physician, born at Niemes, Northern Bohemia. After studying at the universities of Prague and Berlin, he was appointed a lecturer at Berlin in 1818, and a member of the College of Medicine at Stettin in 1822. From 1824 to 1850 he was a councilor in the Prussian Government service. In the study of epidemics, he traveled through Hungary, Transylvania, and

Galicia. His works, *Untersuchungen über die Rinderpest* (1831) and *Die Pest des Orients* (1837), deal with these investigations. His *Zum Schutz der Gesundheit in den Schulen* (1836; new ed. 1861) effected a revival of gymnastics in German schools. His autobiography appeared in 1864.

LO'RIS (probably from Dutch *loeris*, clown, from *loer*, *loerd*, fool, from OF., Fr. *lourd*, stupid, from Lat. *luridus*, wan, from *luror*, pale yellow color; otherwise explained as the native East Indian name). Either of two Asiatic lemurs forming the subfamily Lorisinæ, and differing from the true lemurs in having a round head, very long limbs, and short muzzle, very large eyes, and no tail. The two species known are both natives of the East Indies. The largest species (*Nycticebus tardigradus*) is not so large as a cat; the other, the slender loris (*Loris gracilis*), is much smaller, and is confined to Southern India and Ceylon. They are nocturnal animals, and spend the day generally sleeping, attached to a branch, which they grasp firmly with all their four hands, the body rolled up into a ball, and the head hidden among the legs. Their fur is rich and soft. Their motions are slow, and they advance stealthily on the insects and birds on which they prey. They feed, however, partly on fruits and vegetables. The first named, or 'slow' loris, is the object of much superstitious regard among the Malays, because of its secretive habits and weird appearance. Consult: Beddard, *Mammalia* (London, 1902); Flower et al., in *Proceedings of the Zoölogical Society* (London, 1864 and 1900). See Plate of Lemurs.

LORIS-MELIKOFF, lō'rês mĕ'lyê-kôf, Mikhail Tarielovitch, Count (1825-88). A Russian general and statesman, born in Tiflis, November 2, 1825. He received a military education, entered the army in 1843, won an excellent reputation in the Caucasus, commanded a regiment during the Crimean War, when he had several successful engagements with the enemy in front of Kars, and on the capitulation of that stronghold was appointed its Governor. In 1856 he was made a major-general, and in 1863 rose to be lieutenant-general. He was appointed general of cavalry in 1875. In 1876 he was placed in command of the corps which was stationed on the Armenian frontier, and on the declaration of war against Turkey in 1877 marched into the enemy's territory. He besieged Kars, but failed to take the city, and met with a number of reverses, which compelled him to raise the siege. Receiving reënforcements, he won in October the battle of Alaja-Dagh, and in the following month took Kars. For this brilliant campaign he was made a count in 1878. He was appointed Governor-General of Kharkov in 1879, proving as successful an administrator as he was a soldier. In 1880, the Nihilist movement having become alarming, he was intrusted by the Czar with an administrative commission, giving him almost dictatorial power in the Empire. He subsequently became Minister of the Interior, and induced Alexander II. to establish some form of representative government, a plan the execution of which was prevented by the assassination of the Czar (March 13, 1881). Loris-Melikoff left office in May of the same year. He died at Nice, December 24, 1888.

LORITUS, lô-rē'tụs, or **LORITI**, Heinrich. The original name of the Swiss humanist better known as Glareanus (q.v.).

LORMIAN, lôr'myäN', Baour. See Baour-Lormian, Pierre Marie François Louis.

LOR'NA DOONE. A novel by R. D. Blackmore (1869).

LORNE, Sir John. See Argyll, John Douglas Sutherland Campbell, ninth Duke of.

LORNSEN, lôrn'*sen*, Uwe Jens (1793-1838). A Danish patriot, born at Keitum, on the island of Sylt, and educated at Kiel and at Jena. The July Revolution roused his old ideas of independence and patriotism, and in 1830 he published a pamphlet, *Ueber das Verfassungswerk in Schleswig-Holstein*, a strong argument and a bold plea for autonomy. He was sentenced to a year's imprisonment in May, 1831, and soon after his liberation the Danish Government offered him a pension if he would leave the country. He refused the offer, but, strangely enough, possibly because of ill health, in 1833 went to Amsterdam and sailed for Rio Janeiro. Four years later he returned to Europe and settled in Geneva. In 1838 he shot himself. He wrote: *Die Unionsverfassung Dänemarks und Schleswig-Holsteins*, which was published by Beseler in 1841. Consult Jansen, *Uwe Jens Lornsen* (Kiel, 1872; 2d ed. 1893).

LORO. See Parrot-Fish.

LORRAIN, lô'räN', Claude. See Gelée, Claude.

LORRAINE, lô'rān'. The name of several States which have figured in mediæval and modern history, now the designation of a region mainly in France and partly in Germany. On the death of Lothair I. (q.v.), Roman Emperor and grandson of Charles the Great, in 855, his son Lothair II. inherited the region between the Rhine and the rivers Scheldt and Meuse, extending from the North Sea to the headwaters of the Saône. This country, which was erected into a kingdom, was called *Lotharii Regnum*, Kingdom of Lothair, whence Lotharingia, Lothringen, and Lorraine. It corresponded approximately to the earlier Austrasia (q.v.). In 870 the region was partitioned between Louis the German and Charles the Bald (q.v.), King of the West Franks, and the name Lorraine blotted out from the map. In 895 Lorraine was reëstablished by King Arnulf for his son Zeventibold, and soon after it passed to Louis the Child, King of Germany. The kings of France attempted to annex the country, but the German kings succeeded in retaining possession of it. In 959 it was divided into two duchies, Upper Lorraine and Lower Lorraine. The former centred around the Moselle, the latter around the Meuse. The two were separated by the forest of Ardennes. The duchies were united again in 1033, but divided permanently in 1048. The most noted of the dukes of Lower Lorraine was Godfrey de Bouillon (q.v.). By the middle of the thirteenth century Lower Lorraine had come to be divided among the counts of Louvain (later dukes of Brabant), the counts of Holland, Limburg, and Luxemburg, and the bishops of Utrecht. After many vicissitudes, most of it passed under the sway of the dukes of Burgundy. Upper Lorraine, which contained Metz, Toul, Verdun, Treves, Nancy, etc., was styled Lorraine in the thirteenth century, as the dukes of Lower Lorraine called themselves dukes of Brabant. The dukes of Lorraine continued to rule down to the eighteenth century. The duchy was a member of the Germanic body, but had close relations with France. In 1736 it passed to Stanislas Leszczynski, ex-King of Poland, while its last independent duke, Francis Stephen, husband of Maria Theresa of Austria, received Tuscany in exchange. On the death of Stanislas in 1766 it was united to France. In 1552 France had seized and annexed the bishoprics of Toul, Metz, and Verdun. The name Lorraine was applied to an administrative division which included the former Duchy of Lorraine, the Duchy of Bar, the three bishoprics of Metz, Toul, and Verdun, French Luxemburg, German Lorraine, and the Duchy of Bouillon. It was afterwards subdivided into the departments of Meuse, Moselle, Meurthe, and Vosges. By the Treaty of Frankfort, May 10, 1871, France ceded to Germany portions of the departments of Moselle and Meurthe (German Lorraine and Metz). This district forms part of the Reichsland of Elsass-Lothringen. For the early history of Lorraine consult Comte d'Haussonville, *La réunion de la Lorraine à la France* (4 vols., 2d ed., Paris, 1860). See ALSACE-LORRAINE.

LORRAINE, DUKES AND CARDINALS OF. See GUISE.

LORRAINE GLASS. The name of Claude Lorraine glass is given to peculiarly tinted glass, sometimes used in opera-glasses and stereoscopes, which is supposed to give to the objects viewed the coloring characteristic of the artist's works. The Lorraine mirror, sometimes used by artists, consists of a polished plate of glass ground very slightly convex on the exterior and concave on the inner side, which is coated with a surface of black composition highly polished. This is so placed as to reflect a landscape, which may be then drawn from the reduced image in the glass, the convexity of surface assisting in the perspective and distance. See GLASS.

LOR'REQUER, HARRY. The hero of Charles Lever's (q.v.) military novel of the same name.

LORRIS, lō'rēs', GUILLAUME DE. A French troubadour. See GUILLAUME DE LORRIS.

LORTZING, lŏrts'ĭng, GUSTAV ALBERT (1803-51). A German operatic composer, born in Berlin. His parents were members of a traveling theatrical troupe. and the boy was practically self-taught, save for a few lessons received from a teacher in Berlin (Rungenhagen). He produced his first opera, *Ali Pascha von Janina*, in 1824, and in 1826 joined the permanent company of the Court Theatre at Detmold. His next two works were vaudevilles, *Der Pole und sein Kind* and *Scene aus Mozarts Leben*. His most successful opera is *Zar und Zimmermann*, which is to this day performed in every German opera house. *Der Waffenschmied* and *Die beiden Schützen* were scarcely less popular. His uneven temperament and character greatly interfered with his artistic as well as his material success. Conductor of the Leipzig Opera in 1844, he almost immediately quarreled with the management and had to resign. After a brief period, however, admirers secured his reinstatement; but a second quarrel brought his engagement to an end. In 1850 he was appointed kapellmeister of the new Friedrich Wilhelmstädtisches Theater in Berlin, where he produced some successful light operas, farces, etc. He was a prolific composer, and his music was melodic. Many of his operas are still popular on the provincial German stage. He died in Berlin.

LORY (Malay, Hind. *lūrī*, *nūrī*). (1) Any of the small, brush-tongued, honey-eating parrots of the family Loriidæ (or Trichoglossidæ), which vary in size from that of a dove to that of a sparrow; the lesser forms are usually called lorikeets (or loriquets). The group includes about 90 species, and is confined to Polynesia and Australasia excepting New Zealand. These parrots, whose most important anatomical peculiarity is the structure of the tongue, which is tipped with a bundle of bristles, have a dense soft plumage, exhibiting the most rich and mellow colors; the tail is rounded, generally not long; the bill is feebler than in many of the parrots, and the upper mandible much arched. They are very active and lively, even in confinement, and are also of very gentle and affectionate disposition. Red, green, blue, and yellow are the prevailing colors of their plumage, and a remarkable sexual dimorphism exists, at least in the central genus (Eclectus), where the females are prevailingly green, while the males are red. Until recently the sexes were frequently considered different species. One of the most beautiful and interesting of the groups is the genus Domicella. For much curious information, and an extensive bibliography, consult Newton's article "Lory," in *Dictionary of Birds* (London and New York, 1893-96). See Colored Plate of PARROTS.

(2) A dealer's name for the Australian parrots of the genus Aprosmictus, more usually called 'king lory.'

(3) In South Africa, a turaco (q.v.).

LOS ANGELES, lôs äng'нâ-lâs. Capital of the Province of Bío-Bío, Central Chile (Map: Chile, C 11). It is situated between the Laja and Bío-Bío rivers in a fertile district. Settled in 1739, it figured somewhat in the struggles with the Araucanian Indians. Population, in 1895, 7868.

LOS ANGELES, lôs ăṉ'gĕl-ĕs *or* ăn'jĕl-ĕs. The largest city of southern California, and the county-seat of Los Angeles County, 480 miles southeast of San Francisco; on the Los Angeles River, 20 miles from its mouth, and on the Southern California, the South Pacific, and the San Pedro, Los Angeles and Salt Lake railroads (Map: California, D 4). It is immediately south of the Sierra Madre range, and 15 miles east of the Pacific Ocean, though San Pedro, its seaport, a city with a harbor admitting vessels of 20 feet draught, and having (1900) 1787 inhabitants, is distant 25 miles.

Los Angeles is renowned for its beauty, and for the healthfulness of its mild, equable climate. Its broad avenues are embowered in luxuriant foliage, and the adjacent orange groves and fine fruit gardens present a marked contrast to the barren coasts of the vast unirrigated region thereabouts. In the vicinity are other places celebrated as pleasure, health, and seaside resorts, notably Redondo Beach, Santa Monica, and Santa Catalina Island. The city is the seat of a State normal school, Saint Vincent's College (Roman Catholic), opened in 1865, University of Southern California (Methodist Episcopal), opened in 1880, and Occidental College

(Presbyterian), opened in 1887. Among the prominent buildings are the city hall, county court-house, Federal building, opera house, Roman Catholic cathedral, and the Blanchard Art Building. Also of interest are the Old Plaza Church, the headquarters of General Frémont, the viaduct of the electric street-car road over the railroad tracks in the eastern part of the city, the district known as Chinatown, and Sonora Town. There are a public library of 60,000 volumes, several hospitals and asylums, beautiful cemeteries, a crematory, and magnificent botanical gardens and parks—notably Elysian, Westlake, Eastlake, Echo, Hollenbeck, Griffith, Central, and Plaza parks. More than 3700 acres in parks are accessible to the public; of these fully 3000 acres are outside the city limits.

Los Angeles has important fruit-growing and shipping interests, and is an extensive wine-making place. Oranges and lemons are by far the leading exports, but there is a large trade also in cereals and garden stuff. The city is the mining centre for southern California and Arizona, the surrounding region having valuable deposits of gold, silver, lead, and coal, and producing asphalt and petroleum. The refining of petroleum is an important industry in Los Angeles.

The government is vested in a mayor, biennially elected; a unicameral council; and administrative departments. The public library is in charge of five trustees appointed by the executive; the police, fire, park, and health departments are each in the hands of four commissioners elected by the council, the mayor being ex-officio member of these bodies and chairman; the department of education is under the control of a board of nine members, one from each ward, chosen by popular election. The city spends annually in maintenance and operation over $1,350,000, the main items of expense being about $445,000 for schools, $130,000 for the police department, $125,000 for the fire department, $90,000 for street-cleaning, $55,000 for parks, and $45,000 for municipal lighting.

Los Angeles was settled by the Spaniards as Puebla de Nuestra Señora la Reina de los Angeles (City of Our Lady, the Queen of the Angels) in 1781, and until 1847 alternated with Monterey as the seat of government for the Mexican Province of California. In 1846 it was taken by Commodore Stockton, U.S.N., after slight opposition. In 1851 it was chartered as a city. Population, in 1850, 1610; in 1860, 4385; in 1870, 5728; in 1880, 11,183; in 1890, 50,395; in 1900, 102,479, with a foreign-born population of 20,000, and a total colored population of 4400, including 2100 persons of negro descent.

LOSAN'TIVILLE. A name originally selected for the present city of Cincinnati, intended to mean the 'town opposite the mouth of the Licking.' The word is made up of the initial letter of Licking, the Latin *os*, mouth, *anti-*, opposite, and *ville*. In 1790 the name was changed to Cincinnati.

LOS HERREROS, lôs â-rā'rôs. See BRETON DE LOS HERREROS.

LOSKIEL, lôs-kēl', GEORGE HENRY (1740-1814). A Moravian bishop. He was born at Angermuende, Courland, Russia; was educated at the Moravian College and Theological School in Germany; was consecrated to the episcopal office in 1802, and appointed presiding bishop of the northern district of the American province. He resigned that position in 1811, and was appointed a member of the chief executive board of the Moravian Church at Bertelsdorf, Saxony; but his health had failed, and he was not able to leave the United States. He was author of a book of meditations for every day in the year, entitled *Etwas fürs Herz* (1806), which is still in high repute; and of a *Geschichte der Mission der evangelischen Brüder unter den Indianern von Nordamerika*, the materials for which were derived from the accounts of Gottlieb Spangenburg and David Zeisburger (1789; Eng. trans., 1794). Consult his *Life and Letters*, edited by Schweinitz (Philadelphia, 1871).

LOSS (AS. *los*, from *for-lēosan*, Goth. *fralinsan*, OHG. *for-liosan*, Ger. *ver-lieren*, to lose; connected with Lat. *luere*, Gk. λύειν, *lyein*, to loose). In its legal sense, the deprivation of some right or thing, which the law recognizes as having value, against the will of the person entitled to its possession. It may apply to property, as the loss of goods, or to a more intangible right, as loss of good repute or professional reputation. The term implies, in law, that the person thus unwillingly deprived of the right or thing, is still entitled to its possession or enjoyment. For example, where a watch is said to be lost, the implication is that it has gone out of the possession of the owner without his consent and knowledge, and that he still owns it. It is, therefore, the direct opposite of conveyance or transfer, which import a conscious act of the will.

The word is employed in a somewhat technical sense in insurance law, to denote the damage suffered by the party insured upon the happening of the casualty insured against. See the article INSURANCE.

LOS SEISES, lōs sȧ-ē'sės. A mediæval ritual dance introduced into Toledo and Seville by Cardinal Ximenes. It is still given in Spain on the feasts of Corpus Christi and the Immaculate Conception, and on the three days of the carnival. The dance is performed by twelve young choir-boys, in two sets of six each (hence the name 'The Sixes'). The boys emphasize the rhythm of the dance, whose music is slow and stately, with castanets. Their costumes are blue for Corpus Christi and red for the Immaculate Conception, while their shoes and stockings are white. The dance is given at vesper-time before the Holy Sacrament, and is witnessed by the Cardinal Archbishop and clergy.

LOS'SING, BENSON JOHN (1813-91). An American popular historian, born in Beekman, N. Y., February 12, 1813. He died June 3, 1891. Lossing began active life as a literary journalist, publisher, and engraver. He got up the *Pictorial Field Book of the Revolution* (1850-52), and *The Hudson from the Wilderness to the Sea* (1866). A natural sequel to the former book was *Pictorial Field Book of the Civil War* (1866-69), followed by *Pictorial Field Book of the War of 1812* (1868). Investigations connected with the preparation of these works led to many historical studies, of which the chief are: *The Life and Times of Philip Schuyler* (1860; rev. 1880); a series of school histories; a large history of the United States; *Our Country* (1873); *The American Centenary* (1876); *Story of the United States Navy for Boys* (1880); *Cyclopædia of United States History*

(1881); *History of New York City* (1884); followed by *The Empire State* (1887).

LOSSINI, lôs-sē′nê. An island in the Adriatic Sea. See LUSSIN.

LOST CAUSE. A term used of the Southern issues at stake in the Civil War, State sovereignty and the institution of slavery. It owes its origin to E. A. Pollard's history of the war bearing that title (1866).

LOST CHORD. A short poem by Adelaide A. Procter, which appeared in *Household Words*, and again in *Legends and Lyrics*, a collection of her poems, in 1858. It was set to music by Sir Arthur Sullivan.

LOST PLEIAD, THE. (1) One of the seven stars composing the constellation into which the Pleiades were changed, and of which only six are visible. The missing star was explained as Merope, who concealed herself in shame at having married a mortal, or as Electra, who abandoned her place in order that she might not witness the overthrow of Troy. (2) A poem by Letitia E. Landon (1829). (3) A well-known painting by T. B. Read.

LOST PROPERTY. See FINDING.

LOST RIVER. A river of West Virginia, which in one part of its course disappears into underground channels.

LOST TRIBES OF ISRAEL. See BABYLONISH CAPTIVITY; JEWS.

LOT, lôt. A southwest department of France, formerly part of the Province of Guienne (Map: France, H 7). Area, 2012 square miles. It is watered by the Dordogne and the Lot, with its tributary, the Sellé. A range of hills, broad, but not high, and containing some iron, runs through the centre of the department from east to west in the form of a semicircle. The valleys yield corn, hemp, tobacco, and fruits, and the hillsides are clothed with grapevines. Flaxmills are numerous. Capital, Cahors (q.v.). Population, in 1896, 240,403; in 1901, 226,720.

LOT (Lat. *Oltis*). A river of Southern France, one of the largest tributaries of the Garonne (Map: France, J 7). It rises in the Cévennes at an altitude of nearly 5000 feet, and flows in a westerly direction through the departments of Lozère, Aveyron, Lot, and Lot-et-Garonne, joining the Garonne at Aiguillon, after a winding course of 300 miles. It is navigable for 194 miles and slack-water navigation is made possible by a system of locks.

LOT. According to the Book of Genesis, the son of Haran and nephew of Abraham, and, through his daughters, ancestor of the Moabites and Ammonites. He is said to have emigrated with Terah and Abraham from Ur of the Chaldees to Haran, and with the latter to Caanan (Gen. xi. 27-xii. 5). There Abraham and Lot separated, and Lot chose to dwell in the 'circle of the Jordan,' i.e. the plain between Jericho and Zoar, near the Dead Sea; he made his abode in Sodom (xiii. 5-12). He was captured in a raid upon Sodom and rescued by Abraham (ch. xiv.). Dwelling in Sodom, he is brought into connection with the destruction of the city, which is described with many details (xix. 1-29). Lot is often mentioned in the Koran, and is regarded as a teacher of righteousness (e.g. sura vii. 78-82; xxvi. 160-174), and the Arabs still call the Dead Sea *Bahr Lut*, or Sea of Lot. Many modern scholars regard the narrative of Lot as a combination of tribal traditions with legendary and perhaps mythical admixtures. As the nephew of Abraham he is thought to represent a minor Aramaic clan, once in close affiliation with a Hebrew clan and afterwards separated from it. The separation can hardly have been an amicable one, for otherwise tradition would hardly have represented Lot as the ancestor of two tribes so hateful to Hebrews as Moabites and Ammonites. The rescue by Abraham, if it has any historical basis, belongs to the period when the relations were still friendly. The story of Lot's incest with his daughters reminds of passages in early Arabic poetry, where it is often sought to bring a rival (or a hostile clan) into disrepute by casting suspicion upon his descent. The destruction of Sodom and Gomorrah is also paralleled by various tales circulated among the Arabs. It is not impossible that Lot is identical with Lotan, the eponym of a Horite clan (Gen. xxxvi. 20, 22, 29). The sojourn of Lot in a cave (Heb. *hor*, cave) would then find a natural explanation. See SODOM AND GOMORRAH.

LOT. (1) The King of Norway, husband of King Arthur's sister Anne, and father of Walgan and Modred, in *Geoffrey of Monmouth.* (2) The King of Orkney, in Malory's *Morte d'Arthur.* He is the husband of Margawse, King Arthur's sister, and the father of Gawain, Agravain, Gaheris, and Gareth. In Tennyson's *Crowning of Arthur*, his wife is Bellicent.

LOT-ET-GARONNE, lô′tȧ-gȧ′rŏn′. A southwest department of France, formerly part of the Province of Guienne (Map: France, G 7). Area, 2067 square miles. The department is level, except in the south, where spurs of the Pyrenees make their appearance, and extremely fertile in the basins of the Garonne and Lot, its chief rivers; the east is chiefly composed of barren wastes, and the southwest of sandy and marshy tracts termed *landes*. The chief mineral is iron. The principal products are corn, wine, hemp, fruits, tobacco, anise, and coriander. There are pine, cork, and chestnut woods; poultry are reared in great numbers for exportation. Capital, Agen. Population, in 1896, 286,377; in 1901, 278,740, among whom are a considerable number of French Protestants.

LOTHAIR (lô-thâr′) **I.** (c.795-855). A Frankish ruler, Roman Emperor from 840 to 855. He was the eldest son of Louis the Pious (q.v.). He was associated with his father in the Empire in 817, and was crowned by the Pope in 823. After the partition of 829 he revolted against his father, deposed him, and was sole Emperor until 831, when Louis the Pious was liberated from prison. In 833 there was a new revolt of the sons of Louis the Pious, and the Emperor was defeated by treachery on the field of Lies. But in 834 Louis again assumed the government, and Lothair received as his portion merely the Kingdom of Italy, which he ruled until by the division of 839 he received the eastern part of the Empire in addition to Italy. After the death of Louis the Pious, Lothair attempted to assert his power, as overlord, over his brothers, but was conquered at Fontenoy, June 25, 841. By the Treaty of Verdun, in 843, the title of Emperor was guaranteed to him, together with the sovereignty over Italy, a long strip of territory between the Rhine and the rivers Scheldt and Meuse, and the region between the Rhone and the Alps. His later years contain little worthy of note. He died in 855, after having divided his kingdom among his three sons, and having assumed for himself the monastic garb. Consult Dümmler, *Geschichte des ostfränkischen Reiches*, vol. i. (2d ed., Leipzig, 1887).

LOTHAIR II. (?-869). A Frankish ruler, proclaimed King in 855 by the nobles of Lorraine on the death of his father, Lothair I. He is best known on account of his attempt to divorce his wife, Theutberga, in order to marry his concubine, Walddrade. Pope Nicholas I. (858-867) interfered, and deposed the archbishops of Treves and Cologne, who had granted a divorce to Lothair. Consult Dümmler, *Geschichte des ostfränkischen Reiches* (2d ed., Leipzig, 1887-88). See NICHOLAS I.

LOTHAIR III. (**II.**), THE SAXON (c.1060-1137). German Emperor from 1125 to 1137, Count of Supplinburg, and Duke of the Saxons. He was the third King of the name, but the second Emperor, hence the variation in the numbering. Through his wife, Richenza, he had secured large possessions in Saxony, and in 1106, as a reward of his services to Henry V., he received the Saxon duchy. He soon revolted against Henry, and was in hostile relations with him during most of his reign. At the death of Henry Lothair was elected Emperor by the opponents of Frederick, Duke of Swabia, of the House of Hohenstaufen. He gave his daughter and heiress, Gertrude, in marriage to Henry the Proud, Duke of Bavaria, and invested that prince with the Duchy of Saxony. Henceforth there was a great struggle for ascendency between the powerful houses of Guelph and Hohenstaufen. The Hohenstaufen revolted against Lothair, and submitted to him only after ten years of war, in 1135. Lothair also was successful in extending German influence on the east and north, asserting the Imperial power against Slavs and Danes. He made two expeditions into Italy, and died on December 4, 1137, while returning from that country. Consult: Jaffé, *Geschichte des Deutschen Reichs unter Lothar dem Sachsen* (Berlin, 1843); Bernhardi, *Jahrbücher des Deutschen Reichs unter Lothar von Supplinburg* (Leipzig, 1879).

LOTHAIRE, lō-thär′ (941-986). King of France. He succeeded his father, Louis d'Outremer, in 954. He was engaged in struggles with his great vassals, Richard, Duke of Normandy, Hugh Capet, and others, and was unable to uphold the royal authority. In 978 he set out to conquer Lorraine, and attempted to surprise and capture the Emperor Otho II. at Aix-la-Chapelle. He failed, and the Germans advanced to the walls of Paris. Lothaire was forced to give up his claims to Lorraine. In 983 he made a second attempt to conquer that country. He had succeeded in taking the stronghold of Verdun when he died.

LO′THARIN′GIA. See LORRAINE.

LOTHA′RIO. (1) In Rowe's *Fair Penitent*, a young nobleman of Genoa, who seduces Calista, the wife of Altamont, and is killed in a duel by the latter. He is the type of the libertine. (2) A character in Cervantes's *Novela del curioso impertinente*, who is persuaded by Anselmo to test the virtue of Anselmo's wife. Lothario does as his friend bids him, but with disastrous results. This story is told in *Don Quixote*. (3) A character in Goethe's *Wilhelm Meisters Lehrjahre*, regarded by the hero as the ideal of culture and manhood. He is supposed to represent Karl August.

LO′THIANS, THE. The counties of Haddington, Edinburgh, and Linlithgow, Scotland, respectively known as East Lothian, Mid-Lothian, and West Lothian. The name was anciently applied to the whole territory between the rivers Tweed and Forth, which from 547 to 1018 formed a part of Berenicia or Northumbria.

LO′THROP, AMY. A pseudonym of Anna Bartlett Warner (q.v.).

LOTHROP, HARRIETT MULFORD (STONE) (1844—). An American author, born in New Haven, Conn. She married Daniel Lothrop, the Boston publisher, in 1881. Her books, usually for children, are published under her pen-name of Margaret Sidney. They include: *Five Little Peppers, and How They Grew* (1882); *The Pettibone Name* (1883); *What the Seven Did* (1883); *The Minute-Man* (1886); and *Dilly and the Captain* (1887).

LOTI, lō′tē′, PIERRE (1850—). A name assumed by Louis Marie Julien Viaud. A French novelist and naval officer, of Huguenot ancestry, born at Rochefort, January 14, 1850. He entered the marine service in 1867 and traveled extensively, resigning his naval office in 1898 with the rank of lieutenant. Twelve years intervened between his first cruise and *Aziyadë* (1879), his first novel. Loti has a power of impressionistic description and of suggesting a vague melancholy that is quite unique. To every landscape he gives an individuality. Environment with him seems not only to explain but to condition character. He chooses always strange scenes—Constantinople in *Aziyadë*, Tahiti in *Rarahu* (1880), reprinted as *Le Mariage de Loti* (1882), Senegal in *Le roman d'un spahi* (1881), Brittany and a man-of-war in *Mon frère Yves* (1883), the fishing fleet in *Le pêcheur d'Islande* (1886), Algeria in *Le Kasbah* (1884), Japan in *Madame Chrysanthème* (1887), the Basque country in *Ramuntcho* (1897). Often he gives impressionist pictures with no thread of narrative, as in *Au Maroc* (1890), *Le Désert* (1895), and *Galilée* (1895). His latest work is his impressions of India, published in the *Revue des Deux Mondes* (1903). Loti's stories are little more than log-books of sentiments, of which the strongest is a shrinking from excessive culture, "from modern sham, false luxury, uniformity, and imbeciles." It is the primitive that attracts him in civilization, scene, race, and character. His heroines, Aziyadë, Rarahu, Fatou-gaye, Madame Chrysanthème, Gaud, and the rest, are all creatures of primitive emotions. Intensity of passion, resignation, a universal pity are the abiding moral characteristics of his work, most intensely expressed in *Le livre de la pitié et de la mort* (1891) and *Figures et choses qui passent* (1897). In making prose the vehicle of sensation, Loti has surpassed Flaubert and the Goncourts. The virtuosity of his impressionism lies in its very simplicity. It gives no defined picture, but a very intense impression of a new mode of thought and feeling, of exotic ethics and strange manners. Loti was elected to the Academy in 1891, and the usual academic edition of his *Works* was begun in 1893 (9 vols., 1900). For critical essays, consult: Lemaître, *Contemporains*, vol. iii. (Paris, 1888); Doumic, *Ecrivains d'aujourd'hui* (ib., 1894).

LOTICHIUS, lō-tĭk'ĭ-ụs, Petrus, Secundus (1528-60). A German humanist, born at Schlüchtern. He was educated in the school of the Abbey of Schlüchtern, and studied medicine at Marburg and classical literature at Wittenberg under Melanchthon. In 1557 he was made professor of medicine at Heidelberg. His Latin poetry was highly praised by his contemporaries; it was modeled after Ovid and Vergil, and was for the most part pagan in tone, but treated biblical themes occasionally. The best edition of his *Elegiarum Liber et Carminum Libellus* (1551) is by the younger Burmann (1754), and was translated into German by Köstlin (1826). Consult the novel *Der Professor von Heidelberg*, by Otto Müller (1870), and the biography by Ebrard, *Peter Lotich der jüngere* (Gütersloh, 1883). His nephew, Johann Peter Lotich (1598-1669), was an historian and a Latin poet.

LOTION (Lat. *lotio*, a washing, from *lávare*, Gk. λούειν, *louein*, to wash), or Wash. A non-oily solution or mixture of medicinal agents, intended for external application upon limited areas of the body. Lotions usually consist of a soluble astringent salt, dissolved in water, with perhaps some glycerin or alcohol added. Among anodyne lotions are combinations of lead water and opium, and the 'black wash' (a mixture of a dram of calomel to a pint of lime-water). The latter is very serviceable for ulcers and unclean wounds, especially those of venereal origin. Among stimulating lotions is a solution of sal ammoniac in water or in vinegar with or without the addition of alcohol; it is serviceable where there is no wound of the skin, as for rheumatism, neuralgia, etc. Antiseptic lotions contain bichloride of mercury, or carbolic acid, or boracic acid, etc. A *fomentation* is a lotion used hot. A *collyrium* is an eye-wash, and generally contains a soluble astringent salt, such as subacetate of lead or sulphate of zinc, or nitrate of silver.

LOTOPH'AGI. See Lotus-Eaters.

LOT'TA. The stage name of Charlotte Crabtree (q.v.).

LOTTER, lôt'tẽr. A family of German printers, intimately connected with the Reformation. The founder of the family was Melchior Lotter, the elder, born at Aue, and well known at Leipzig as early as 1491. He published missals, breviaries, a *Persius* (1512), *Horatii Epistolæ* (1522), and *Luther Tessaradecos Consolatoria pro Laborantibus* (1520). His relations with the Reformation are not perfectly clear, but he seems to have been a secret sympathizer. An innovation by the elder Lotter was his use of Roman letters for Latin, reserving the Gothic types for German. His son was also named Melchior (?-c.1542), which has resulted in some bibliographical confusion. Melchior, the younger, is best known for printing Luther's Bible, *Das neue Testament* (1522), and the impressions of 1523 and 1524 of the Old Testament, which was transferred afterwards to Lufft (q.v.). He published many other German writings of Luther. Only a little less important was his bringing a Greek font to Wittenberg, thus giving Melanchthon the means to carry on classes in Greek. When he returned to Leipzig, about 1525, Lotter carried on his father's business.

LOTTERY (Fr. *loterie*, from *lot*, lot, from ML. *lottum*, lot, from MLG. *lot*, Goth. *hlauts*, OHG. *hlōz*, *lōz*, Ger. *Los*, AS. *hlot*, Eng. *lot*). In principle, a game of chance wherein a large number of persons unite to create a fund out of which prizes, greatly exceeding in value any individual contribution, are assigned by lot to a small number of participants. The earliest lottery of which authoritative record exists took place at Bruges in 1446. In 1530 a lottery with money prizes is recorded at Florence; and before the end of the sixteenth century it appears that lotteries were very common throughout Italy. In 1569 a lottery was held in England. This lottery was under the patronage of Queen Elizabeth, and much official pressure was brought to bear to secure subscriptions. In 1612 a lottery was granted for the benefit of the Colony of Virginia; and in 1627 a license was given to raise by a lottery money to build an aqueduct from Hoddesdon to London. Throughout the seventeenth century lotteries became increasingly frequent both in England and on the Continent of Europe, and in the eighteenth century all Europe succumbed to a veritable lottery mania. The States nearly everywhere established a public monopoly of the business, sometimes managing them on public account, sometimes farming them to private individuals. The practice was soon adopted in the American colonies. In 1720 we find notice of a lottery in Philadelphia, the prize being a new brick house, for which 350 tickets at 20 shillings each were to be drawn. Soon after lotteries became common in Pennsylvania, and in 1729 the Legislature prohibited them, but the law appears to have remained a dead letter. Many of these early lotteries were organized for public objects —the paving of streets, the construction of wharves, and the like. Lotteries for the erection of churches and educational buildings became common in most of the colonies after the middle of the century. In 1750 a lottery was organized to raise an edifice for Yale College; Harvard raised funds in a similar way in 1772, and again in 1806. The difficulty in raising funds for public purposes led to the great extension of lotteries in the colonial period; and even after the Revolution they were frequently employed.

In the early part of the nineteenth century, the mischievous influence of lotteries came to be generally recognized. In 1826 they were prohibited in England; in 1832, in France; in 1830, in Belgium; in 1841, in Sweden. In the American States, opposition to lotteries rapidly developed, and in 1833 they were prohibited by New York and Massachusetts, and by most of the other States in the two following decades. The last stronghold of the lottery was Louisiana. The Louisiana State Lottery, which received a charter for twenty-five years in 1868, had a monopoly of the business within the State, and was required to pay the sum of $40,000 a year into the State treasury. In 1890 the company made great efforts to secure a renewal of its charter, offering finally an annual payment of $1,250,000 for it; but the act rechartering the company was vetoed by the Governor. By an act of Congress of 1890, the transmission through the mails of lottery advertisements, or of registered letters addressed to lotteries or their agents, is prohibited. Lotteries of one kind or another, generally managed on State account, still exist in most of the countries of Europe, and yield a very considerable revenue. They are generally admitted to exercise a very baneful influence, encouraging recklessness and unthrift, especially in the lower classes of society.

For a discussion of the various principles upon which lotteries are organized, consult Palgrave, "Lotteries," in *Dictionary of Political Economy* (London, 1896); for a good discussion of the social and economic effects of the lottery, Lasson, *Lotterie und Volkswirtschaft* (Berlin, 1894). An excellent account of English lotteries will be found in Ashton, *History of English Lotteries* (London, 1893). The best short history of lotteries in America is Spofford's "Lotteries in American History," in *Annual Report of the American Historical Association* (Washington, 1892).

LOTTI, lŏt'tê, ANTONIO (c.1667-1740). An Italian composer, born probably in Venice. His father had been Court kapellmeister at Hanover, and the boy early began to study music. He completed his musical education under Legrenzi, and by his seventeenth year had produced an opera, *Il Giustino*. In 1687 he became a chorister at Saint Mark's, in 1690 assistant organist, in 1704 chief organist, and in 1736 he obtained the much-coveted post of *maestro*. On the invitation of the Elector of Saxony, Lotti spent two years (1717-19) at Dresden. At first almost entirely an operatic composer, his later years were devoted to sacred music, his choral compositions being unusually impressive. He affected the severe contrapuntal style, but softened it by a more modern use of harmonic devices; while in his church music he avoided orchestral accompaniments in order to retain unhampered the original melodies. In addition to being a skillful composer, Lotti was a popular and capable teacher. He composed twenty operas, which were, however, of but ephemeral interest. His most famous works were his misereres, masses, and motets. He died in Venice.

LOTTO (It., lot). A game of chance, played on boards divided into 27 squares arranged in three horizontal rows. Five squares in each horizontal row are marked with numbers between 1 and 90, four squares being left blank. The first vertical row contains units, the second tens, etc. The game may be played by an indefinite number of persons, each of whom is provided with a board, on which he covers the space marked with the number corresponding to that of a counter drawn from a bag and called out by a dealer. The winner is the player who first covers all the five numbers on any horizontal row.

LOTTO, lŏt'tô, LORENZO (c.1480-c.1556). An Italian painter, born in Venice. He studied in Venice under Giovanni Bellini, and sometimes imitated his manner, but also that of Palma, Giorgione, and Titian. He lived many years at Bergamo, then went to Recanati, and lastly to Loreto, where he died. Toward 1548 his powers had decidedly declined, but before that date he produced a number of notable pictures, among them: "Virgin and Saints" (Borghese Gallery, Rome); "The Three Ages of Man" (Pitti Palace, Florence), which is often attributed to Giorgione; "Saint Jerome," in the Louvre, Paris; "Virgin with Saints," at Bergamo (1621); and some portraits at the Brera Gallery, Milan. His last works are so like Titian's that it has been difficult to tell them apart in many cases. Lotto seemed to have the faculty of assimilating the style of each painter he imitated, without entirely losing his native power.

LOTUS (Lat. *lotus*, from Gk. *λωτός*, a name given to several different plants). The name given by the Greeks to a number of different plants whose fruit was used for food. One of the most notable of these is the *Zizyphus Lotus*, a native of the north of Africa and the south of Europe, belonging to the natural order Rhamnaceæ. (See JUJUBE.) The fruit of the Diospyros lotus, or date plum, was sometimes called the lotus. The name lotus was also given to several beautiful species of water-lily (q.v.), especially to the blue water-lily (*Nymphæa capensis*), the Egyptian water-lily (*Nymphæa Lotus*), and to the nelumbo (*Nelumbo speciosa*) (q.v.), which grow in stagnant and slowly running water in the south of Asia and north of Africa. The *Nymphæa Lotus* grows in the Nile and adjacent rivulets, and has a large white flower. The root is eaten by the people who live near Lake Menzaleh. It was the favorite flower of ancient Egypt, and is still often seen made into wreaths or garlands, placed on the foreheads of women or held in their hands, and smelled for its fragrance. It frequently appears in the hieroglyphs, where it represents the upper country or Southern Egypt, and entered largely into works of art. In mythology, it was the special emblem of Nefer Atum, the son of Ptah and Bast; the god Harpocrates is seated upon it; and there was a mystical lotus of the sun. In the mythology of the Hindus and Chinese the *Nelumbo Lotus* plays a distinguished

EGYPTIAN LOTUS.

part, being called the sacred bean. The Hindu deities of the different sects are often represented seated on a throne of its shape, or on the expanded flower. It symbolized the world; the *meru*, or residence of the gods; and female beauty. Among the Chinese the lotus had a similar reputation and poetic meaning, being especially connected with Fuh, or Buddha, and symbolizing female beauty, the small feet of their women being called kin loën, or 'golden lilies.' In the United States the name lotus is often applied to the yellow water-lily or water-chinquapin (*Nelumbo lutea*). Lotus is also the generic name for a genus of leguminous plants, of which there are about 80 species. They have leaves with three leaflets and red, yellow, or white flowers. One of the best known is bird's-foot clover (*Lotus corniculatus*). It grows on light sandy soils where hardly any other plant will thrive and is much liked by stock. It is commonly grown in Europe and in the United States, especially at the South. In Europe *Celtis australis*, the hackberry (q.v.), is called lotus. See Colored Plate of AQUATIC PLANTS.

LOTUS BIRD. The Queensland parra. See JACANA.

LOTUS-EATERS (Lat. *Lotophagi*, from Λωτοφάγοι, from λωτός, *lōtos*, lotus + φαγεῖν, *phagein*, to eat). A mythical Libyan people, inhabiting a portion of Cyrenaica, in Northern Africa. These people were greatly dependent for subsistence on the fruit of a tree which also yielded an excellent wine, and it made those who partook of it forget all about their native land. The place was visited by Ulysses in his wanderings, and no sooner had his sailors eaten the fruit and partaken of the juice than they lost all desire of returning to Greece. The plant has been identified as the jujube (*Zizyphus lotus*). The people living on the coast of Tripoli now eat the jujube fruit and make from it a favorite drink. Other plants mentioned in this connection are the *Celtis australis*, the nettle tree, a member of the elm tribe which bears a small sweet fruit, and also the fig.

LOTUS TREE. See HACKBERRY.

LOTZE, lō′tse, RUDOLF HERMANN (1817-81). A German philosopher. He was born at Bautzen in Saxony, and educated at Leipzig, where in 1839 he took doctor's degrees in medicine and philosophy, and became a privat-docent in both subjects. In 1842 he was made professor extraordinary in the university, and two years later succeeded Herbart in the professorship at Göttingen. Here he did all his subsequent work. In 1881 he was called to Berlin, but delivered lectures there only part of a semester before his death on July 1, 1881. Among his more important works are: *Metaphysik* (1841); *Logik* (1843); *Mikrokosmus* (1856-64); and *Geschichte der Aesthetik in Deutschland* (1868). Of his projected definitive *System der Philosophie* only two parts were completed before his death—the *Logik* (1874; 2d ed. 1881) and the *Metaphysik* (1879); an English translation of both has appeared (Oxford, 1884; reprinted 1887-88). After his death also appeared notes from his lectures on the important disciplines of philosophy (Eng. trans., ed. G. T. Ladd, 6 vols., Boston, 1884-87). Lotze was one of the most influential philosophers of the latter half of the nineteenth century. His main significance is to be found in his attempt to reconcile mechanism and teleology: i.e. to show that a scientific explanation of phenomena by efficient causation does not exclude purpose. Mechanism, instead of being antagonistic to teleology, was considered a necessary element in any true system of teleology; for it is only an aspect of the interrelation of things, and interrelation is essential to a world in which purpose may be realized. Relations do not obtain between independent things; they are states of things; they are as much attributes of things as sensible qualities are. Things, therefore, are not independent, but are essentially related. What these things are in their inner nature can be conceived only by analogy. Spirit is the only form of inner being that we know; hence following out this analogy he gets a system of monads (see LEIBNITZ), which must all be thought to be grounded in a supreme absolute personality or God. In his philosophy, especially of the absolute, Lotze is influenced as much by the pressure of his feelings and emotions as by the demands of logic, and his idealism is ethical rather than intellectual. In psychology, his most noteworthy contribution was the local-sign theory, according to which the distinctive, non-spatial sense-attributes, which vary according to the locality of the sense-organs stimulated, are the original element out of which our space-consciousness is built.

Consult: Lindsay, "Hermann Lotze," in *Mind* (1876); Santayna, "Lotze's Moral Idealism," in *Mind* (1890); Eastwood, "Lotze's Antithesis Between Thought and Things," in *Mind* (1892); Jones, *A Critical Account of the Philosophy of Lotze, the Doctrine of Thought* (New York, 1895); Hartmann, *Lotzes Philosophie* (Leipzig, 1888); Moore, *The Ethical Aspect of Lotze's Metaphysics* (New York, 1901); Robins, *Some Problems of Lotze's Theory of Knowledge* (ib., 1900); E. Pfleiderer, *Lotzes philosophische Weltanschauung nach ihren Grundzügen* (2d ed., Boston, 1884); Vorbrodt, *Prinzipien der Ethik und Religionsphilosophie Lotzes* (Dessau, 1891).

LOUBET, lo͞o′bā′, EMILE (1838—). A French statesman, seventh President of the French Republic. He was born at Marsanne, in the Department of Drôme, Southern France, the son of a prosperous peasant proprietor. He was educated in Paris, where he graduated in law, and then returned south and established himself in practice at Montélimar. His legal ability soon attracted attention, and won for him recognition and influence. He was appointed counsel for the Paris, Lyons and Mediterranean Railway, and became mayor of the city of Montélimar. In 1876 he was elected to the Chamber of Deputies. Here he joined the group known as the Republican Left. He was reëlected to the Lower House in 1877 and 1881, and in 1885 was chosen Senator. In December, 1887, he entered the Cabinet of M. Tirard as Minister of Public Works, but retired with his colleagues in April following. On February 29, 1892, he became Premier by appointment of President Carnot, who was his personal friend, succeeding M. de Freycinet. He himself took the portfolio of the Interior. His administration, which lasted until November, was marked by successfully meeting the problems arising from the miners' strike at Carmaux, and by the unearthing of the Panama scandal, but upon a favorable vote in the Chamber on a resolution declaring that the Government policy was too passive, he resigned. Reëlected to the Senate, he was chosen president of that body in 1896 and again in 1898. On February 16, 1899, occurred the sudden death of President Félix Faure, and two days later the National Assembly, comprising both Houses of Parliament, met in joint session and on the first ballot chose M. Loubet as President of the Republic. His Presidency strengthened the Republic, and became marked by an almost total disappearance of the Monarchists as a party.

LOUDON, lou'dôn, GIDEON ERNST. An Austrian general. See LAUDON.

LOUDON, lou'don, JOHN CLAUDIUS (1783-1843). A Scotch botanist, born at Cambuslang, Lanarkshire. He got his education in Edinburgh, and in 1803 went to London as a landscape gardener. In 1806 he was elected to the Linnæan Society, and three years later he rented a large farm in Oxfordshire; but the investments, although at first remunerative, failed, and an accident to his right arm six years later at length (1825) required its amputation. In 1826 he first published the *Gardener's Magazine*, and in 1828 began the *Magazine of Natural History*. His great work, the *Arboretum et Fruticetum Britannicum*, issued in monthly parts, was a financial failure, and he was forced to take up his old trade of landscape gardener, in which he had great success. He established and edited the *Architectural Magazine*, to which John Ruskin contributed. Among his writings are: *Observations on Laying Out Public Squares* (1803); *An Immediate and Effective Mode of Raising the Rental of the Landed Property of England* (1808); the *Encyclopædia of Gardening* (1822); the *Encyclopædia of Agriculture* (1825); and the *Encyclopædia of Plants* (1829). The genus *Loudonia* was named after him.

LOUDOUN, lou'don, JOHN CAMPBELL, fourth Earl of (1705-82). A British soldier, the only son of Hugh, third Earl of Loudoun. He succeeded his father in 1731, and from 1734 was a representative peer of Scotland. He entered the army in 1727, and took an active part on the side of the Government in the rebellion of 1745. In March, 1756, he was sent out to command all the British forces in America. From Albany he issued orders for a much reprobated embargo on all outgoing vessels in order to conceal a proposed attack on Louisburg. He then sailed from New York to Halifax, where he collected an army of 10,000 English and colonial troops, and a large fleet; but hearing that the French fleet numbered one more vessel than his own, he lingered for a time in Nova Scotia, and then returned to New York without striking a blow. Upon the entry of Pitt to power, Loudoun was recalled, and General Amherst was appointed to his place. In 1762 Loudoun was sent as second in command with the English expedition to Portugal.

LOUGHBOROUGH, lŭf'bŭr-ō. A manufacturing and market town in Leicestershire, England, 12 miles northwest of Leicester and the second place of importance in the county (Map: England, E 4). Its chief buildings are the restored parish church dating from the fourteenth century, the building of the richly endowed grammar school, founded in 1495, and the town hall and corn exchange. It is the railway centre of a rich agricultural district and has a fine market place. The town has undergone much modern improvement, and owns its water, gas, and electric lighting, parks, markets, cemeteries, allotment gardens and charities. The town utilizes its waste; it burns the garbage in special destructors which generate steam for the pumps of the sewage works, the sewage being utilized on farms. The town also supports a free library, provides technical instruction in arts and sciences, and with its numerous endowed schools has exceptional educational advantages. Hosiery and lace are its principal manufactures; it has iron foundries, and a bell foundry whence came the great bell (17½ tons) of Saint Paul's, London. There are also machine shops, electrical works, etc. Loughborough dates from before the Norman Conquest, and the town and manor were bestowed upon Hugh Lupus by William I. It is mentioned in Domesday Book as Lucteburne. Population, in 1891, 18,196; in 1901, 21,500.

LOUIS I., lōō'ĭs *or* lōō'ĭ; *Fr. pron.* lōō'ē', THE PIOUS (called by the French *le Débonnaire*, i.e. 'tender-hearted to the point of weakness') (778-840). Roman Emperor and King of the Franks from 814 to 840; youngest son of Charles the Great. His elder brothers having died, he succeeded his father in 814. Although not destitute of ability, his lack of energy and decision finally resulted in the dissolution of the Empire of Charles the Great. In 817 he apportioned the empire among his three sons, Lothair, Pepin, and Louis, to take effect after his death, but he had Lothair crowned as Emperor. The others were dissatisfied, while Bernard, a nephew of Louis, who had been made King of Italy by Charles the Great, finding himself threatened by the new arrangement, revolted. The Emperor, getting Bernard into his power, put out his eyes, Bernard dying soon after as a result of his mutilation. In his remorse the Emperor did public penance and wished to enter a monastery, but yielded to the importunity of his advisers and in 819 married a second wife, Judith of Bavaria, who in 823 bore him a son, known in history as Charles the Bald. In 829, in the interest of this son, he proposed a new division of the Empire; but to this the elder sons, Lothair, Louis, and Pepin, objected, and the result was a state of disorder which lasted during the remainder of the Emperor's life. Twice was the father taken prisoner, and deposed by his sons (in 830 and, in 833, on the famous Field of Lies); but Lothair, by his ambition incurred the hostility of his brothers, who conspired to restore their father to the throne. Pepin died in 838, and Louis made a new division the following year in favor of Lothair and Charles, leaving only Bavaria to Louis, and excluding the son of Pepin. Against this arrangement Louis revolted, and was joined by the son of Pepin. In the midst of the war the Emperor died near Ingelheim. He was buried at Metz. Consult: Simson, *Jahrbücher des fränkischen Reichs unter Ludwig dem Frommen* (Leipzig, 1862-65); Dümmler, *Geschichte des ostfränkischen Reichs* (2d ed., Leipzig, 1887-88).

LOUIS II. (c.822-875). Roman Emperor from 855 to 875, son of Lothair I. He was made King of the Lombards in 844, was crowned Emperor in 850, and succeeded his father in Italy in 855. He was a weak ruler, and under him the power of the Empire declined rapidly. His conquests from the Saracens in the south of Italy were appropriated by the Greek Emperor. He left only one child, a daughter, married to Boso, King of Provence. Consult Gregorovius, *History of the City of Rome in the Middle Ages*, translated by Hamilton (London, 1894-1900).

LOUIS III. (c.880-924). Roman Emperor. He was the son of Boso, King of Burgundy, and Irmengarde, daughter of the Emperor Louis II. In 887 he succeeded his father, under his mother's regency, as a vassal of Charles the Fat. After the death of King Lambert (898) he engaged in a contest for the crown of Italy with Berengar I., and in 901 received the Imperial crown at Rome; but he quarreled with his Italian underlords, and in his absence lost Pavia and Verona. Louis returned to Italy, and recovered Verona, but was surprised and captured by Berengar, who put out his eyes and sent him back to Burgundy (905). During the last twenty years of his life his lands were held by Hugh, his kinsman.

LOUIS IV. (c.1287-1347). Holy Roman Emperor from 1314 to 1347, surnamed the Bavarian. He was a son of Louis the Strict, Duke of Upper Bavaria, and Matilda, daughter of the Emperor Rudolph I. of Hapsburg. He succeeded his father in 1294, his mother being Regent, but after a long contest with his brother, Rudolph, allowed the latter a share in the Government. In 1314 he was elected King of the Romans as the successor of Henry VII. of Luxemburg. Four of the electors voted for him, but three declared in favor of his cousin, Frederick the Fair, of Austria, son of the Emperor Albert I. and grandson of Rudolph of Hapsburg, the latter being proclaimed Emperor as Frederick III. In the war which ensued Louis won the battle of Mühldorf, September 28, 1322, and took Frederick prisoner. Having by his support of the Visconti in Milan aroused the enmity of Pope John XXII., he was excommunicated in 1324, and was commanded by the Pope to appear before him; but Louis appealed to a general council, and the summons was declared null and void by the Diet of Ratisbon. In the same year he married Margaret of Holland. In 1325 a treaty was concluded by which Frederick was released from imprisonment on condition that he return into captivity if he should find himself unable to induce his adherents to transfer their allegiance. Failing in his attempt, Frederick gave himself up in conformity with his oath, and was appointed Governor of the Bavarian possessions of Louis. In 1327 Louis plunged into conflict with the Pope, entered Italy, and was crowned King of Lombardy at Milan. In the following year he received the Imperial crown at Rome from the hands of Sciarra Colonna. (See COLONNA.) Through his influence John XXII. was deposed, and Peter de Corbara was raised to the Papal throne as Nicholas V. On his way back to Germany Louis was defeated near Milan (1329), and the Antipope Nicholas V. was soon compelled to abdicate. The German princes, however, aided Louis in his struggles against the Papacy at Avignon, and at a diet at Rhense (q.v.) in 1328 the electors declared that the election of an Emperor needed no Papal confirmation. In 1345 Louis added to his power by the acquisition of the dominions of Holland, Zealand, Hainault, and Friesland, which after the death of William IV. of Holland descended to Louis's wife, Margaret of Holland. He died of a stroke of apoplexy. His Court was noted on account of the many famous writers who gathered there to aid in the struggle against John XXII. Most notable among these was Marsilius of Padua (q.v.). Consult Fischer, *Ludwig IV., der Bayer* (Leipzig, 1882).

LOUIS III., THE CHILD (893-911). King of Germany from 900 to 911. He was raised to the throne of Germany soon after the death of his father, Arnulf, by the influence of Archbishop Hatto of Mainz, who governed the country in the name of Louis. Germany was in a wretched condition under his rule, and the Hungarians seized this opportunity to devastate the German lands as far as Thuringia. The Carolingian dynasty in Germany ended with Louis III. Consult Gregorovius, *History of the City of Rome in the Middle Ages*, translated by Hamilton (London, 1894-1900). See CAROLINGIANS.

LOUIS I., OF ANJOU (1339-84). A King of Naples, son of John the Good of France. After the Peace of Bretigny in 1360, he was given as a hostage to Edward III. of England, but returned to France on parole in 1363, and remained there. He became Governor of Languedoc under Charles V., and fought bravely against the English. In 1380 he became regent for the incapable Charles VI., and at the instance of the Antipope Clement VII. was adopted by Joanna I., Queen of Naples, as her successor. The rival Pope, Urban VI., supported Charles of Durazzo, who succeeded in making good his claim against Louis. See CHARLES III. OF NAPLES; JOANNA I.

LOUIS II., OF ANJOU (1377-1417). An unsuccessful claimant to the throne of Naples. Inheriting a claim from his father, Louis I., he set out for his kingdom in 1390, and took possession of it, but at the end of about nine years was driven out by Ladislas, son of his father's rival, Charles of Durazzo. About twelve years later Louis determined again to conquer the Kingdom. He won the battle of Roccasecca in 1411, but lost the help of the Pope, and retired to France. His daughter, Marie, married Charles VII.

LOUIS III., OF ANJOU (1403-34). A claimant to the throne of Naples, son of Louis II. He was adopted as her successor by Queen Joanna II. He had a rival in Alfonso V. of Aragon, whom Joanna had adopted and then thrust aside, and the two waged war with each other. Louis died before the Queen.

LOUIS I. (Ger. **LUDWIG**) (1786-1868). King of Bavaria. The eldest son of King Maximilian I., he was born at Strassburg, and educated at Landshut and Göttingen. He fought unwillingly against Prussia in 1807, and against Austria in 1809. He early showed a taste for art, and traveled twice to Rome while still a prince. In 1825 he succeeded to the throne. His reign was distinguished by the encouragement of the fine arts and the erection of magnificent public buildings, but it was no less characterized in later years by contempt of constitutional rights and forms. Moreover, the King's conduct gave great occasion for scandal, particularly in his connection with the dancer Lola Montez (q.v.). On account of the revolutionary disturbances in February and March, 1848, he resigned the crown in favor of his eldest son, Maximilian II.

LOUIS II. (1845-86). King of Bavaria. He succeeded his father, Maximilian II., in 1864.

He was a bachelor and eccentric, showing himself infrequently to his subjects, and being devoted more to art, especially music, than to the cares of government. His generosity toward Richard Wagner, the composer, upon whom he bestowed gifts and honors, caused great dissatisfaction in the country. He joined Prussia against France in 1870-71, though he did not go to the front in person, and favored the unity of Germany under the Imperial rule of William I. He followed his own caprices rather than the guidance of any political party, though he used his influence against the Ultramontanes. He piled up beautiful buildings, regardless of expense, and imposed an immense debt on the country. It was his extravagance that caused the ministers to have him declared insane, June 10, 1886. Three days later he drowned himself in the Starnberger See.

LOUIS II., the Strict (1228-94). A Duke of Bavaria, grandson of Louis I. and successor and son of Otho II. In 1253 he began to rule, together with his brother Henry; but two years afterwards divided the duchy with him, taking for his own share Upper Bavaria and the Rhenish Palatinate. Louis's nickname, 'the Strict,' he gained by frequent fits of unreasonable severity. In 1256 he executed Marie of Brabant, his first wife. He made many wars, and on the whole was the greatest prince of his day in Southern Germany. With the Archbishop of Mainz he urged the election of Rudolph of Hapsburg to the Imperial throne, and was the only one of the electors to stand by the Hapsburgs after Rudolph's death. He married, for his third wife, Mathilde, Rudolph's daughter, and left his lands to his sons, Rudolph and Louis. Consult Sölte, *Ludwig der Strenge* (Nuremberg, 1857).

LOUIS VII., the Bearded (1365-1447). A Duke of Bavaria and Ingolstadt. He was brother to Elisabeth, wife of Charles VI. of France, and had a great influence on his brother-in-law. His greed won him the hate of the Parisian mob, from which he was barely rescued in 1413. In Germany his imperious temper kept him in continual quarrels, and in 1417 he was set upon by assassins, hired by Duke Henry the Rich, and severely wounded. In the politics of the period Louis was prominent. He joined the Marbach League in 1406; fought bravely and cruelly to win back the old Wittelsbach title of Margrave of Brandenburg from Friedrich, brother-in-law of Duke Henry; and, in 1433, fell under the Papal ban for failure to appear at the Council of Basel. His son Louis (1404-45) made war on him in 1438, because of his partiality to Wieland, a natural child, captured him in 1443, and kept him in constraint until 1445. Then the Duke fell into the hands of his old enemy, Henry of Landshut, and died after a year in prison at Burghausen, his property going to Henry. Consult Lang, *Geschichte Ludwigs des Bärtigen* (Nuremberg, 1821).

LOUIS I. King of the Franks. See Louis I., the Pious.

LOUIS II., le Bègue, i.e. the Stammerer (846-879). King of the West Franks from 877 to 879. He was a son of Charles the Bald, and in 867 he was crowned King of Aquitaine. He succeeded his father in 877 and died April 10, 879. Louis had little power.

LOUIS III. (863?-882). King of the West Franks from 879 to 882. He was the son of Louis II. At his father's death he and his brother Carloman succeeded to the throne, although not without opposition, as their legitimacy was questioned. Louis was successful against the rebellious nobles and expelled the Northmen from the region of the Loire and Somme, defeating them in a great battle at Saucourt, which has been commemorated in the German poem the *Ludwigslied.*

LOUIS III. (**II.**), the Younger (c.825-882). A King of the East Franks, son of Louis the German. In 865 he received from his father, as his share of the kingdom, Franconia, Saxony, and Thuringia. He rebelled repeatedly against his paternal overlord. Louis the German died in 876 in the midst of a war against Charles the Bald, King of the West Franks. Louis the Younger in the same year defeated Charles at Andernach. He secured the royal title, and added Friesland and Bavaria to his possessions. Louis in 879 attempted to win the crown of the West Franks. In this he failed, but he became master of the whole of Lorraine. He died at Frankfort after a severe campaign against the Normans.

LOUIS IV., called d'Outremer ('from beyond the sea') (921-954). King of France from 936 to 954. He was a son of Charles the Simple, and was taken by his mother to England in 921, where he was educated at the Court of King Athelstan, his mother's brother, hence his surname. On the death of Rudolph of Burgundy, in 936, he was called to the French throne by Hugh of Paris and William of Normandy. At first his reign was troubled by a revolt headed by Hugh, who was dissatisfied with his policy, and in 940 Louis was compelled to flee. His return was effected largely by the exertions of William of Normandy. On the latter's death, nevertheless, Louis tried to wrest Normandy from the young Duke Richard, who, however, aided by the King of Denmark, made Louis prisoner. He was released, but soon was again engaged in a war with Hugh and Richard, which lasted until 950. Twice also Louis had to repel Hungarian invaders. He died September, 954, leaving two sons, Lothair, who succeeded him, and Charles, who became Duke of Lower Lorraine.

LOUIS V., le Fainéant ('the Sluggard') (c.967-987). King of France from 986 to 987. He was a son of Lothair and a grandson of Louis d'Outremer. He was associated with his father in the kingship in 979. He was the last King of the Carolingian dynasty in France. His surname was not justified. Consult Lot, *Les derniers Carolingiens, Lothaire, Louis V., Charles de Lorraine* (Paris, 1891).

LOUIS VI., le Gros, i.e. the Fat (c.1080-1137). King of France from 1108 to 1137. He was the son of Philip I., and was associated with his father in the government in 1100; he succeeded his father in 1108. As King he did much for the defense of the Church, but his main efforts were directed toward controlling the feudal lords of the Isle de France and adding to the royal domains. He destroyed many of the nobles' castles and never neglected an opportunity to gain additional lands, no matter how small the territory in question. From the beginning of his reign he was engaged in wars with Henry I. of

England. He died August 1, 1137. Consult: Luchaire, *Louis VI. le Gros* (Paris, 1889); id., *Les communes françaises* (Paris, 1890); id., *Histoire des institutions monarchiques de la France sous les premiers Capétiens* (Paris, 1891).

LOUIS VII., le Jeune, i.e. the Young (c.1120-80). King of France from 1137 to 1180. He was the son of Louis VI., whom he succeeded in 1137. Just before his father's death he had married Eleanor of Aquitaine (q.v.). In 1147 he went on the Second Crusade, accompanied by his wife, whose frivolous conduct in the Holy Land aroused much scandal. In 1152 he was divorced from Eleanor, who married within a few weeks Henry Plantagenet, bringing him as her dowry Aquitaine with other lands, and making the English King more powerful in France than Louis himself. (See Henry II. of England.) A war broke out in 1152 between Henry and Louis, which continued until 1160. Louis died September 18, 1180. Although not as vigorous as his father, he followed the policy of the latter and made his royal power respected. Consult: Luchaire, *Etudes sur les actes de Louis VII.* (Paris, 1885), and other works by the same author cited under Louis VI.; also Hirsch, *Studien zur Geschichte König Ludwigs VII. von Frankreich* (Leipzig, 1892).

LOUIS VIII., le Lion (1187-1226). King of France from 1223 to 1226. He was the son of Philip Augustus. In 1215 and 1219 he engaged in crusades against the Albigenses. During the revolt of the English barons against John the crown was offered to him by a party among the nobles. In 1216 Louis landed in England, to which he laid claim as legitimate heir, and was well received; but the death of John and the accession of Henry III. prevented his success. In 1217 he signed the Peace of Lambeth, and withdrew after receiving a large war indemnity. He succeeded his father in 1223. In 1226 he led a crusade against the Albigenses, and died while returning, November 8, 1226. In his short reign Louis followed faithfully the traditions of Philip Augustus, and increased the royal power, especially in the south. His wife was Blanche of Castile (q.v.). Consult Petit-Dutaillis, *Etude sur la vie et le règne de Louis VIII.* (Paris, 1894).

LOUIS IX., known as Saint Louis (1215-70). King of France from 1226 to 1270. He was born April 25, 1215, and succeeded his father, Louis VIII., in 1226. His mother, Blanche of Castile, a woman of great talent and sincere piety, was Regent during his minority, and bestowed on him a strictly religious education, which materially influenced his character and policy. In 1242 Louis became involved in a war with Henry III. of England, and defeated the English at Taillebourg and at Saintes. During a dangerous illness, in 1244, he made a vow that if he recovered he would go in person on a crusade, and accordingly, having appointed his mother Regent, he sailed in August, 1248, with 40,000 men to Cyprus, whence, in the following spring, he proceeded to Egypt, thinking, by the conquest of that country, to open the way to Palestine. He took Damietta, but was afterwards defeated and taken prisoner by the Mohammedans, April 6, 1250. A ransom of a million besants procured his release on May 8, 1250, together with the survivors (6000 men) of his army. He proceeded by sea to Acre, and remained in Palestine till the death of his mother, in November, 1252, compelled him to return to France. He now applied himself earnestly to the affairs of his kingdom, united certain provinces to the Crown on the lapse of feudal rights or by treaty, and made many important changes, the general tendency of which was to increase the royal power. The code of laws known as the *Etablissements de Saint Louis* is, however, only the work of a private compiler. Louis embarked on a new crusade July 1, 1270, and proceeded to Tunis; but a pestilence broke out in the French camp which carried off the greater part of the army and the King himself. He died August 25, 1270, and his son, Philip III., was glad to make peace and return to France. Pope Boniface VIII. canonized him in 1297. Louis was the most distinguished monarch of his time. His piety, justice, and mercy caused him to be trusted, while his ability made him respected. Joinville's *History of Saint Louis* is the best source of information as to the character of the King, as seen by a shrewd contemporary, who was intimate with Louis. Consult: Berger, *Saint Louis et Innocent IV.* (Paris, 1893); id., *Histoire de Blanche de Castile* (Paris, 1895); Lecoy de la Marche, *La France sous Saint Louis* (Paris, 1893); Langlois, *Saint Louis* (Paris, 1887).

LOUIS X., le Hutin, i.e. the Quarreler (1289-1316). King of France from 1314 to 1316. He was the eldest son of Philip IV. During his short reign the government was mainly in the hands of ministers. When he died, on June 5, 1316, there was for the first time no direct male heir in the Capetian dynasty. A posthumous son (John I.) was born, but he died in a few months, and the throne went to Louis's brother, Philip V.

LOUIS XI. (1423-83). King of France from 1461 to 1483. He was the eldest son of Charles VII., and was born at Bourges, July 3, 1423. Louis was by nature cruel, tyrannical, and perfidious, and in 1440 and 1456 he made unsuccessful attempts against his father's throne. He was compelled to flee to Brabant in 1456 and sought the protection of Philip the Good, Duke of Burgundy, with whom he remained till his father's death in 1461, when he succeeded to the crown. The severe measures which he immediately adopted against the great vassals led to a coalition against him, at the head of which were the great houses of Burgundy and Brittany. (See League of the Public Weal.) Louis owed his success over the princes more to his artful policy than to arms. When the war threatened to break out anew, he invited Charles the Bold (q.v.), Duke of Burgundy, to a friendly conference at Péronne, in October, 1468. His agents meanwhile had stirred up the people of Liège to revolt against the Duke, upon the news of which occurrence Charles made the King a prisoner, and extorted from him a humiliating treaty. Louis, however, did not observe this treaty, and a contest broke out, which lasted until the death of Charles the Bold in 1477. Charles was aided by Edward IV. of England, while Louis incited the Swiss and René of Lorraine to oppose the ambitious undertakings of Charles. Charles the Bold left an only daughter, the celebrated Mary of Burgundy, who married Maximilian of Austria. Louis claimed a great part of the Burgundian territories as male fiefs lapsed to the superior.

He seized the Duchy of Burgundy, conquered Artois, and subjugated Franche-Comté. War was waged with Maximilian until 1482, when the Treaty of Arras was concluded, by which the daughter of Maximilian was betrothed to the Dauphin, afterwards Charles VIII., and Louis was allowed to retain his conquests. In 1480-81 Anjou, Maine, and Provence were united with the Crown. By his warfare against the feudal lords Louis XI. rid France of the anarchical conditions which had prevailed, and made the central power paramount. He died August 30, 1483. He was a patron of learning, and caused *Les cent nouvelles nouvelles*, an imitation of Boccaccio's *Decamerone*, to be written by a group of authors, between 1457 and 1461. He also materially advanced civilization in France by encouraging manufactures, commerce, and mining. He improved the public roads and canals, established several printing-presses, and founded three universities. His chief counselor during a large part of his reign was the great historian Philip of Comines. Consult: Michelet, *Histoire de France* vol. vi.; Sée, *Louis XI. et les villes* (Paris, 1893); Kitchen, *History of France*, vol. i. (Oxford, 1885).

LOUIS XII. (1462-1515). King of France from 1498 to 1515. He was the son of Charles, Duke of Orleans, and was born at Blois, June 27, 1462. During the reign of Charles VIII. he set himself up in opposition to the Court and was imprisoned for three years (1487-90). Upon the death of Charles VIII. without issue, Louis succeeded to the throne, and in 1499 married Anne of Brittany, the widow of his predecessor, thus assuring the permanent union of Brittany with France. His reign was marked by widespread reforms in the finances and the administration of justice, carried out under the direction of his Chancellor, the astute Cardinal d'Amboise (q.v.), and the mildness of his rule and the prosperity which France enjoyed under him gave him the title of *Père du peuple*. In 1499 Louis, as grandson of Valentina Visconti, daughter of the famous Gian Galeazzo, Duke of Milan, laid claim to that State, and in August of the same year a French army of some 20,000 men invaded the country, overthrew Ludovico Sforza, and in October took the city of Milan. By the Treaty of Granada, in November, 1500, Louis and Ferdinand of Aragon agreed upon the conquest and partition of the Kingdom of Naples. The victors quarreled over the spoils, and in 1503 the French were driven from Southern Italy by Gonsalvo de Córdova. In December, 1508, Louis joined the League of Cambrai, formed by the Pope against Venice, and including in addition Ferdinand of Aragon and the Emperor Maximilian. In May of the following year Louis won the battle of Agnadello, which effectually crushed the power of Venice. The jealousy of his allies led to the conclusion of the Holy League (1511), in which the Pope, Venice, Ferdinand, and Henry VIII. of England united against France. After a victory at Ravenna (April, 1512), where their heroic general, Gaston de Foix, fell, the French were driven out of Lombardy. At the same time Louis was hard pressed by Henry VIII., who landed in France with a strong army and won the Battle of the Spurs in August, 1513. As a part of the peace settlement, concluded in 1514 with the Emperor (who had joined the allies), England, Spain, and the Pope, Louis took (1514) for his third wife Mary Tudor, sister of the English King. He died January 1, 1515, leaving two daughters by Anne of Brittany. He was succeeded by his son-in-law, Francis I. of Angoulême. Consult: Jehan d'Authon (1466-1527), *Chroniques de Louis XII.*, a contemporary account (Paris, 1889-95); Clavière, *Histoire de Louis XII.* (ib., 1890 et seq.); Lacroix, *Louis XII. et Anne de Bretagne* (ib., 1882).

LOUIS XIII. (1601-43). King of France from 1610 to 1643. He was the son of Henry IV. and Maria de' Medici, and was born at Fontainebleau, September 27, 1601. He succeeded to the throne on the death of his father, May 14, 1610, his mother becoming Regent. Louis XIII. took little personal share in the Government, though formally declared of age in 1614. In the following year he married Anne of Austria, daughter of Philip III. of Spain. The Government remained in the hands of the Queen mother and her favorite, Concini, until April, 1617, when the latter was murdered at the instance of the Duke de Luynes, a courtier who had succeeded in establishing a complete ascendency over the mind of the King. The Queen mother was banished to Blois, and for a time there was danger of civil war between the King's party and the adherents of Maria de' Medici. The Duke de Luynes died in 1621, and for a time the chief power was in the hands of La Vieuville, through whose influence Richelieu (q.v.) entered the King's council in 1624. Richelieu speedily became the chief minister of Louis. His powerful mind obtained complete control over that of the King, and his policy effected that increase of monarchical power at the expense of Protestants, nobles, and parliaments, which reached its consummation in the reign of Louis XIV. The Huguenots, during the early years of Louis XIII.'s reign, had shown a restlessness which, combined with their efficient organization, seemed to menace the power of the monarchy. Their influence, which was especially strong in Béarn and Navarre, was weakened by the annexation of those two little States to France. In 1621 this resulted in a formidable rising of the Huguenots in the south, who were led by Rohan and Soubise. After desultory fighting, peace was concluded at Montpellier, which left to the adherents of the Reformed religion, of all their fortified places, only La Rochelle and Montauban. The repression of the Huguenots was carried on by Richelieu. The last of their strongholds, La Rochelle, was taken in October, 1628, and the political power of the Huguenots was gone forever. In foreign politics Richelieu continued the anti-Hapsburg policy of Henry IV. In 1630 the War of the Mantuan Succession was terminated in favor of Richelieu's candidate, Charles of Nevers; but it was the Thirty Years' War (q.v.) which supplied Richelieu with the great opportunity of humiliating the power of the Hapsburgs. Gustavus Adolphus was an ally of France, and after his death the Swedish forces continued to be subsidized by the French King, while the able Protestant general, Bernhard of Weimar, was maintained in the field with French money. The policy of Richelieu resulted in the acquisition of Alsace. In the south, Roussillon was annexed in 1641. Richelieu maintained his ascendency over the King in spite of intrigue and conspiracies on the part of the Court. In 1632 Gaston of Orleans, brother of the King, led a Spanish army into France for the overthrow of the hated minister, but he was defeated at Castelnaudary. A rising under the Count de Soisson was repressed in 1641, and this was followed by the unsuccessful conspiracy of Cinq-Mars (q.v.). Louis died May 14, 1643, less than half a year after his great minister. His Queen, after twenty-three years of married life, bore a son in 1638, who succeeded to the throne as Louis XIV.; and in 1640 a second son, Philip, Duke of Orleans, the ancestor of the present House of Orleans. Consult: Raumer, *Geschichte Ludwigs XIII. und des Kardinals Richelieu* (Leipzig, 1830); Topin, *Louis XIII. et Richelieu* (Paris, 1876), accompanied by letters from the King to Richelieu; Zeller, *La minorité de Louis XIII.* (Paris, 1897). See RICHELIEU; FRANCE.

LOUIS XIV. (1638-1715). King of France from 1643 to 1715, called 'the Great.' He was the son of Louis XIII. and Anne of Austria, and was born at Saint-Germain-en-Laye, September 15 (16?), 1638. He became King of France at the age of five by the death of his father, May 14, 1643. The Queen mother, Anne of Austria, held the regency, but the virtual control of affairs was in the hands of Mazarin, the chief minister, who was more solicitous for the continuance of his own power than for the education of the young King. The discontent of the nobles under the administration of Mazarin brought on the civil wars of the Fronde (q.v.) fomented by Spain, but the rebellion was put down in 1652. The war with Spain, a legacy from the preceding reign, was terminated by the Peace of the Pyrenees in 1659, which gave France part of the Spanish Netherlands and confirmed her in the possession of Roussillon. In 1660 Louis married the Infanta Maria Theresa of Spain, a princess lacking attractive qualities of mind or person. Mazarin died March 9, 1661, and at once the young King showed to what purpose he had studied the example of his father's subserviency to Richelieu and the experience of his own tutelage under Mazarin. He surprised the Court by his prompt assertion of the intention to be his own chief minister. Richelieu and Mazarin had established firmly the foundations of royal power by putting down the nobles and Huguenots and by the foreign policy which had made France the greatest power in Europe. Louis XIV. built on this foundation a structure of the most complete despotism. The young King brought to the task a zest for work which had not been destroyed by a neglected education or the pleasures of a frivolous Court. Lacking in surpassing intellectual qualities himself, he had the gift of recognizing talents in others, and he gathered around him a group of advisers of exceptional ability, whose activity he knew how to subordinate to his own purposes. The brilliant services which they rendered France, far from eclipsing the reputation of the King, redounded only to his own glory. From the *Grand Monarque* alone emanated that vivifying power under the influence of which the national life of France, its industry and commerce, its military strength, its political influence in Europe, attained an unprecedented development. The Court of Louis XIV. was the most magnificent in Europe, and it became the model for European sovereigns. Handsome in person and stately in bearing, with just enough kindliness in his manner to make condescension seem gracious, the monarch moved among a brilliant crowd of soldiers, politicians, prelates, and men of letters, whose unrestrained adulation was probably as sincere as any courtiers' praises in history. His most influential adviser was Colbert (q.v.), his *bourgeois* Minister of Finance (1661-83), a man of reasonable ambitions and great business ability, and in touch with the people. He restored the finances of the Kingdom, which had been impoverished by Mazarin and pilfered by the pleasure-loving Fouquet (q.v.), fostered industries, and by a drastic application of the protective principle of State encouragement, made France a self-supporting and highly productive country. Louvois, who succeeded his father, Le Tellier, as Minister of War, brought the army to a pitch of efficiency which made it the first in Europe. Thus the means were provided for the foreign wars, almost continuous through the King's long reign, which were a necessary accompaniment to his ambitious plans. Foreign conquest for France meant expansion at the cost of Spain, whose possessions in the Netherlands were Louis's first point of attack. After the death of Philip IV. of Spain (1665) Louis laid claim in the name of his wife to certain portions of the Netherlands, as well as Luxemburg and Franche-Comté, basing his claim on various laws of succession prevailing in those provinces. There followed the so-called War of Devolution. In May, 1667, an army of 50,000 men under Turenne invaded the Spanish Netherlands and within three months overran a great part of the country. The Dutch, in alarm, concluded an alliance with England and Sweden to put a stop to the encroachments of France, and in May, 1668, peace was signed at Aix-la-Chapelle, the French King giving back Franche-Comté, but retaining possession of French Flanders. Louis adhered tenaciously to his purpose, however, and, having effected alliances with the Archbishop of Cologne and the Bishop of Münster, whose territories lay to the east of the Netherlands, and having bought off Charles II. of England, he seized Lorraine in 1670, and invaded Holland in 1672. The States-General made an alliance with Spain, Brandenburg, and the German Emperor (1673), to which Louis retorted by seizing Imperial cities in Alsace. Four great armies were put into the field. Condé carried on the campaign on the Meuse, Turenne overran Alsace and Lorraine, Schomberg was intrusted with the defense of Roussillon, while Louis in person with the great engineer Vauban led an army into Franche-Comté, which was speedily and definitely conquered (1674). In the Netherlands, Condé won a victory over the Dutch, Germans, and Spanish at Seneffe (August 11th). After a number of reverses in 1675, occasioned by the death of Turenne, the French armies entered once more upon a series of victories in the Spanish Netherlands, and in March, 1678, Ghent and Ypres were taken. The treaties of Nimeguen (1678-79) restored the territory taken from Holland, under a guarantee of neutrality, but left to France fourteen cities in Flanders, Franche-Comté, and Freiburg in the Breisgau, and imposed such onerous conditions on the Duke of Lorraine that that prince allowed his State to remain in the hands of the French rather than accede to them. Louis was now at the height of his power, and his arrogant ambition knew no bounds. He established at Metz, Breisach, Besançon, and Tournay French courts of claims (*chambres de réunion*), which proceeded *ex parte* to determine what territories belonged to France under the last four international treaties. The chambers decided that with the cities and principalities conquered by France went all territorial possessions which at any time might have been theirs. French armies executed the decisions, adding Strassburg and many border towns to France. France was now dominant in Europe, and its power felt even in Northern Africa, where the depredations of the Barbary pirates led to the bombardment of Tripoli (1681 and 1685) and Algiers (1682 and 1683) by a French fleet. At home Louis ruled like an Oriental despot. The patriotic ambition of the nobility had been strangled along with their unruliness, and they were for the most part content to be mere satellites of the King. The provinces were governed by royal intendants, and every detail of government was rigidly watched by the King. The power of the Church was also brought under the control of the King. The liberties of the Gallican Church as against the Pope were asserted in the National Council of 1682 (see GALLICAN CHURCH), but at the same time uniformity of belief was enforced by the suppression of the Jansenists and the enactment of stringent measures against the Huguenots, who, protected by the Edict of Nantes, were living peacefully in the Kingdom. Arrogant and obstinate as he was, Louis was restrained in many things by the counsel of Colbert while that minister lived. But Colbert died in September, 1683; his death had been preceded by that of the Queen, and in 1684 Louis privately married Madame de Maintenon (q.v.), who for a long time had been his spiritual guide. The Huguenots were gradually subjected to more and more pressure (see DRAGONNADES), and in 1685 the King finally revoked the Edict of Nantes. The exercise of the Reformed religion in France was prohibited, and children were to be educated in the Catholic faith. (See HUGUENOTS.) On the death of the Elector Palatine, in 1685, Louis claimed the territory of the Palatinate in right of the Elector's sister, the Duchess of Orleans. In 1688 he invaded the Palatinate and the neighboring regions. Early in 1689 the Minister of War, Louvois, doubting the possibility of defending the Palatinate against the Imperial Forces, ordered the devastation of that region—an act of inexcusable cruelty, which reduced half a million of people to utter misery. A new coalition was now formed against France, guided by the energy and wisdom of William of Orange, just called to the throne of England. This league, the Grand Alliance, ultimately included England, Holland, Savoy, the Emperor, Brandenburg, Sweden, Spain, Saxony, Bavaria, and the Palatinate. The succeeding campaigns were largely waged in the Netherlands, while Marshal Catinat reduced Savoy. On July 1, 1690, Marshal Luxembourg defeated the Prince of Waldeck at Fleurus; on August 3, 1692, he gained a decisive victory over William III. at Steenkerke, and on July 29,1693, won a second victory at Neerwinden. At sea the French under Tourville gained a great success over the English and Dutch off Dieppe (July, 1690), but this was counterbalanced by the crushing defeat of the French at La Hogue in May, 1692. The Fabian tactics of William III. checked the advance of the French, who were now under the command of the incapable Villeroi; in 1695 the English King took Namur, and thus hastened the approach of peace, of which France, exhausted by the vast campaigns, stood in great need. In 1697 the Peace of Ryswick provided for a mutual restoration of conquests and the garrisoning of the forts in the Spanish Netherlands by Dutch troops as a barrier between France and Holland. Louis was forced to recognize William III. as lawful King of Great Britain and to abstain from lending aid to the exiled Stuarts. Meanwhile Louis was able to maintain his rule at home in the face of growing discontent only by a rigid police espionage, administered by Count d'Argenson. The national finances, restored by the somewhat artificial system of Colbert, were again in a deplorable condition, and the people were threatened with want. The last years of Louis were a period of misfortune as signal as his previous successes had been. The question of the succession to the throne of Spain, left vacant by the childless Charles II., led to the tremendous struggle of the War of the Spanish Succession. (See SUCCESSION WARS.) William revived the Grand Alliance in 1701 to combat the plans of Louis for placing his grandson, Philip of Anjou, upon the Spanish throne. The allies took the field under the able generalship of Marlborough and Prince Eugene and won the great battles of Blenheim (1704), Ramillies (1706), and Oudenarde (1708). After these French disasters negotiations for peace were entered upon, but though Louis was willing to comply with all the demands of the allies in regard to the restoration of his early conquests and to recognize the Austrian Archduke Charles as King of Spain, he would not consent to join the allies in driving his grandson out of Spain. Hostilities were resumed and Marlborough and Prince Eugene inflicted a bloody defeat on the French at Malplaquet (1709). Fortune, however, favored the French King. The death of the Emperor Joseph I. and the accession of the Archduke Charles (Charles VI.) in the Austrian dominions and the German Empire created dissensions in the ranks of the allies; the fall of Marlborough (1712) removed Louis's greatest enemy. The treaties of Utrecht (1713) and Rastadt (1714) brought the war to a close. Philip of Anjou retained the Spanish crown, which, however, was shorn of its possessions in Italy and the Netherlands. France ceded Acadia to England. The obstinate policy of aggrandizement by despotic methods and of the repression of the natural tendencies of the people had its result after a period of factitious glory in a decline of the French power. The looseness and immorality of society, to which the King gave the tone, was another cause of decay. Domestic misfortunes embittered the last years of the King's life. Within the space of a year (1711-12) death carried off the Dauphin Louis, the heir to the throne, together with his two sons, the Dukes of Burgundy and Berry, and the Duke of Burgundy's elder son, the Duke of Brittany. Upon Louis, the second son of the Duke of Burgundy, a sickly child whose life was for a time despaired of, fell the succession to the crown. By his mistress, Madame de Montespan, Louis had two sons, who bore the titles of Duke of Maine and Count of Toulouse. On September 1, 1715, the aged King died at Versailles. His reign had lasted seventy-two years. The epigrammatic statement, *L'état c'est moi*, attributed to him, well described his rôle in French history. He had been France. His life was identified with the zenith of the French power, and his reign witnessed an extraordinary development in letters and arts. Among those whose names adorn this so-called Augustan Age are Corneille, Racine, Molière, Pascal, Boileau, Bossuet, Fénelon, La Fontaine, La Rochefoucauld, Poussin, Claude Lorrain, Mansart, and Claude Perrault. The glory of the French monarchy passed away with Louis XIV.'s death.

Consult: *Œuvres de Louis XIV.* (6 vols., Paris, 1806), annotated edition of historical, political, and military papers and letters of Louis XIV., prepared during the reign of Louis XVI.; Saint-Simon, *Mémoires*, 22 vols., ed. by Chéruel and Regnier, and a useful abridged English trans. by Saint-John in 3 vols. (London, 1876 and 1883); in connection with the foregoing, Chéruel, *Saint-Simon considéré comme historien de Louis XIV.* (Paris, 1865), and Boissier, *Saint-Simon* (Paris, 1892); Gaillardin, *Histoire du règne de Louis XIV.* (Paris, 1871-75); Voltaire, *Siècle de Louis XIV.;* Bourgeois, *France Under Louis XIV.*, trans. from the French (New York, 1897); Hassall, *Louis XIV. and the Zenith of the French Monarchy* (New York, 1895); Philippson, *Das Zeitalter Ludwigs des Vierzehnten*, in the "Oncken Series" (Berlin, 1879); Gérin, *Louis XIV. et le Saint-Siège* (Paris, 1894); for bibliography, Lavisse and Rambauld, *Histoire générale*, vol. vi.

LOUIS XV. (1710-74). King of France from 1715 to 1774. He was the son of the Duke of Burgundy, who died in 1712, and a great-grandson of Louis XIV. He was born at Versailles, February 15, 1710, and succeeded to the throne September 1, 1715. The Duke of Orleans, as first prince of the blood, was Regent during the minority of the King, whose education was intrusted to Marshal Villeroi and Cardinal Fleury. The country was brought to the verge of ruin during the regency, by the folly of the Regent and the financial schemes of the Scotchman John Law (q.v.). When Louis was fifteen years of age he married Maria Leszczynska, daughter of Stanislas, the dethroned King of Poland. Fleury was at the head of affairs from 1726, when he succeeded the Duke of Bourbon as Prime Minister, to 1743, and by parsimony succeeded in improving the condition of the finances. It was his policy also to avoid war, in which, however, Louis was involved in 1733, in support of his father-in-law's claim to the throne of Poland. (See section on *War of Polish Succession* under SUCCESSION WARS.) By the Peace of Vienna (1738) Stanislas renounced his claims to Poland, but received Lorraine and Bar, which devolved upon France at his death (1766). In 1740 France was drawn into the War of the Austrian Succession. After Fleury's death the King, whose life had been passed in idle sensuality, made a spasmodic return to virtue. He took the field in 1745, but in the following year was struck down by a dangerous illness at Metz. The grief of the nation, expressed in general prayers for his recovery, gained him the title of *le bien-aimé*, 'the well-beloved.' The King recovered and in 1745 was present at the battle of Fontenoy, but speedily relapsed into his old life and fell completely under the influence of Madame de Pompadour, who ruled Louis and France for nearly twenty years, directing especially the foreign policy of the country. Vast sums of money were lavished on the all-powerful mistress and on the bacchanalian pleasures with which she knew so well how to please the jaded senses of the profligate King. The Peace of Aix-la-Chapelle, which terminated the War of the Austrian Succession (1748), was but an intermission in the great struggle which was finally to be fought out between France and England and between Austria and Prussia. In 1756 an extraordinary alliance between France and Austria, contrary to the historic policy of the two great rivals, was effected by the diplomacy of Kaunitz (q.v.) and the influence of Madame de Pompadour. There followed the Seven Years' War (q.v.), which resulted in the humiliation of France, defeated by land and sea, and the loss of her colonial empire in America and India by the Peace of Paris (1763). In 1761 a contest broke out between the Parlements and the Jesuits, the former being actuated by motives of traditional hatred, inasmuch as they were the strongholds of Jansenism. The influence of Madame de Pompadour and her favorite, the first Minister Choiseul, were thrown into the scale against the Jesuits, and, though the King was at first inclined to favor them for fear of Rome, the Parlements won the day. In 1762 the Jesuits were declared a corporation hostile to the interests of the State and in 1764 the Order was suppressed. (See JESUITS.) The Parlements, emboldened by their success in this contest, now attempted to limit the power of the Crown by refusing to register edicts of taxation; but the King acted with unusual vigor, maintaining his own absolute and supreme authority, and treating the attempts of the Parlements to unite for one object as rebellious. Choiseul, who had conducted foreign affairs with a certain skill, was displaced from office (1770), a new mistress, Madame Du Barry (q.v.), having now come into the place which had been so long occupied by Madame de Pompadour, and a Ministry was formed under the Duc d'Aiguillon, the most prominent member of which was the Chancellor Maupeou (q.v.), who immediately showed himself a relentless enemy of the Parlements. The Parlement of Paris was abolished, its members banished to the provinces, and a more facile instrument of the royal will, the *conseil du roi*, took its place. This arbitrary act deeply moved the popular indignation. The King, when told of the ruin of the country and the misery and discontent of the people, only remarked that the monarchy would last as long as his life (*Après moi le déluge*), and continued immersed in sensual pleasures. Notwithstanding the bankrupt state of the finances, it is estimated that in five years he lavished more than 100,000,000 livres on Madame Du Barry. He died of smallpox, May 10, 1774, universally disliked and in extreme misery. His reign was fruitful in promoting the French Revolution, the way for which was paved by the writings of Rousseau, Voltaire, and the Encyclopædists. He was succeeded by his grandson, Louis XVI. Consult the Memoirs of Choiseul, Argenson, De Luynes, and others; Broglie, *Le secret du roi*, secret correspondence of the King with his diplomatic agents, 1752-74 (Paris, 1879); id., *Frédéric II. et Louis XV., 1743-44* (ib., 1885); Boutaric, *Correspondance secrète inédite de Louis XV.* (ib., 1866); Goncourt, *Les maîtresses de Louis XV., lettres et documents inédits* (ib., 1860); Saint Armand, *The Last Years of Louis XV.*, trans. from the French (New York, 1893); Raynal, *Le mariage d'un roi* (Paris, 1887); De Tocqueville, *Histoire philosophique du règne de Louis XV.* (ib., 1846).

LOUIS XVI. (1754-93). King of France from 1774 to 1792. He was the third son of the Dauphin Louis, only son of Louis XV., and was born at Versailles, August 23, 1754. By the death of his father and his elder brothers he became Dauphin (1765). He was a lover of hunting and manly exercises, showed an aptitude for mathematics and mechanics, and in the midst of the most corrupt of courts, he grew up temperate, honest, and moral; but he was a weak and incapable ruler. He was married May 16, 1770, to Marie Antoinette, the youngest daughter of the Empress Maria Theresa. When Louis ascended the throne, misery and discontent prevailed throughout France. He lacked the vigor and judgment necessary for the circumstances, but was conscious of his own weakness. He made Maurepas, an old courtier, his Prime Minister; but among his ministers were Malesherbes, Turgot, and other men of known patriotism; and his accession was signalized by the remission of some of the odious taxes, the abolition of the relics of serfdom and of the torture in judicial investigations, a reduction of the expenditure of the Court, and the foundation of institutions for the benefit of the working classes. He was, for a time, popular; but deep-reaching reforms were rendered impossible by the opposition of the Court, headed by the pleasure-loving Marie Antoinette. Turgot resigned in 1776. In June, 1777, when the state of the finances seemed nearly desperate, Necker (q.v.) was called to the office of Comptroller-General, and succeeded in bringing them to a more tolerable condition, without any very radical change; but after the interference of France in the American War of Independence, he was obliged to propose the taxation of the privileged classes, hitherto exempted. Their resistance compelled him to resign, and Joly de Fleury succeeded him; but the general discontent induced the King, in 1783, to appoint as Comptroller-General Calonne (q.v.), who found money for a time by borrowing, much to the satisfaction of the courtiers. But the indignation of the people increasing, Calonne found it necessary to recommend the convening of an Assembly of Notables (q.v.). On May 1, 1787, the Archbishop Loménie de Brienne became Finance Minister. He obtained from the Notables some concessions and some new taxes. But the Parlement of Paris refused to register the edicts of taxation, as oppressive to the people; and the extravagance of the Court and the Queen began to be freely spoken of. The convening of the States-General was demanded from every corner of France. The King registered the edicts in a *lit de justice*, and banished the councilors of the Parlement to Troyes, but ere long found it necessary to recall them, and met an even stronger opposition than before. Recognizing the hopelessness of reform, Brienne was compelled to resign, and Necker again became Minister in August, 1788. An assembly of the Estates of the Kingdom was resolved upon, and by the advice of Necker, who wished a counterpoise to the influence of the nobility, clergy, and Court, the Third Estate was called in double number. The subsequent history of Louis XVI. is inseparably connected with the events of the first four years of the French Revolution (q.v.). His total lack of purpose at a time of crisis when decision was imperative proved his ruin. He wavered between the cause of the Revolution and the counsels of the Royalists and succeeded in losing the confidence of both parties. Influenced by the resolute attitude of the Third Estate, he ordered the nobility and the clergy to join the former in the National Assembly; yet this was followed, on July 11, 1789, by the dismissal of Necker, whom, however, popular indignation compelled the King to recall. On October 5th a Parisian mob, composed mostly of women, incited by the rumor of Royalist plottings, marched upon Versailles and on the following day brought the royal family to Paris, where they made their home in the Tuileries. With the death of Mirabeau (q.v.) the last chance of reconciliation between the monarchy and the National Assembly disappeared, and on the night of June 20-21, 1791, the royal family made their unfortunate attempt to escape to the eastern frontier, where Bouillé (q.v.), commander of the troops at Metz, a Royalist in sympathies, was prepared to lend them succor. At Sainte-Menehould the King and his family were recognized by Drouet, the son of the postmaster, who pursued them into Varennes, where he raised an alarm and caused the fugitives to be seized. The King returned to Paris, and from that day his fall was inevitable, the flight to Varennes having served to confirm the general reports concerning the King's negotiations with the foreign Powers for the overthrow of the newly conquered liberties of the nation. On September 14, 1791, he took the oath to the new Constitution, but his deposition had already been decided on by the party of the Gironde. On June 20, 1792, an organized mob invaded the Tuileries, forced the King to don the liberty cap, and departed after heaping insults on the unhappy Marie Antoinette. On August 10th a still more formidable mob stormed the Tuileries, massacred the Swiss Guard (q.v.), and compelled the royal family to seek refuge in the hall of the Assembly. The King was suspended from his functions and sent a prisoner to the Temple. The Convention which met on September 21st immediately proclaimed France a republic, and in December the deposed King was brought to trial before the Convention on charges of treason. The King defended himself with dignity, but neither his own words nor the eloquence of his counsel (Malesherbes, Duc de Sèzes) could avail against the evident determination of the Mountain to bring about his death. The King was found guilty, and on January 16, 1793, was condemned to death, by 361 to 360. The Girondists who were opposed to the extreme penalty were forced to vote for death out of fear of the Mountain. On January 21st Louis was guillotined on the Place de la Révolution, protesting his innocence and praying for the welfare of his people. Louis XVI. had two sons, of whom the elder died in 1789, the other becoming Dauphin (see LOUIS XVII.), and a daughter, Madame Royale, known as the Duchess of Angoulême. Consult: Bouvet, *Histoire de Louis XVI.* (Paris, 1825); Droz, *Histoire du règne de Louis XVI.* (ib., 1818); Falloux, *Louis XVI.* (4th ed., ib., 1860); Jobez, *La France sous Louis XVI.* (ib., 1877-93); Beaucourt, *Captivité et derniers moments de Louis XVI.* (ib., 1892); Courian, *Louis XVI. et la Révolution* (ib., 1893). See FRANCE; FRENCH REVOLUTION.

LOUIS XVII., Charles (1785-95). Titular King of France after the execution of Louis XVI. on January 21, 1793. He was born on March 27, 1785, the second son of Louis XVI. and Marie Antoinette. After the death of his brother, June 4, 1789, he became heir to the throne, but together with the royal family he was imprisoned in the Temple after August 10, 1792. His fate was a most pitiful one, for he was ultimately delivered over to a brutal shoemaker named Simon, and died from neglect and abuse on June 8, 1795. Though there could be no question of the death of the real Louis XVII., various claimants arose, who had all some followers. There was one Hébert, who appeared in 1828, and carried on a propaganda until his death, in 1845. Then a Prussian named Naundorff and his descendants sought, for a time after 1830, to enforce their so-called claims. About the middle of the nineteenth century many people firmly believed that the lost Dauphin had been found in America in the person of Eleazar Williams, an Episcopal clergyman and missionary to the Indians, of which race his putative great-grandfather was. He seems to have been convinced that he was a Bourbon, and sufficient arguments were brought forward to furnish a book in defense of his claim —Hanson, *The Lost Prince* (New York, 1854); but some of these arguments were afterwards disproved, and the belief lost ground. Williams died in 1858. No one has explained how the escape could possibly have been effected, and why no one appeared before 1804 to show that the Prince had not died. Consult: Chantelauze, *Louis XVII., son enfance, sa prison, et sa mort au Temple* (Paris, 1895); Bülau, *Geheime Geschichten und rätselhafte Menschen*, vol. ii. (2d ed., Leipzig, 1863); Evans, *The Story of Louis XVII. of France* (London, 1893).

LOUIS XVIII. (1755-1824). King of France from 1814 to 1824. He was a younger brother of Louis XVI., and was born at Versailles, November 17, 1755. He received the title of Count of Provence. In 1771 he married Maria Josephine Louisa, daughter of Victor Amadeus III., of Sardinia. After the accession of Louis XVI. to the throne he assumed the designation of 'Monsieur.' He became an opponent of every salutary measure of the Government. He fled from Paris on the same night with the King (1791), and was more fortunate, for, taking the road by Lille, he reached the Belgian frontier in safety. With his brother, the Count d'Artois, he issued declarations against the Revolutionary cause in France, which had a very unfavorable effect on the fortunes of the King. The two brothers for some time held a court at Coblenz, and in 1792, joining with the Prussians under the Duke of Brunswick, led a body of 6000 émigrés across the Rhine. After the death of his brother, Louis XVI., the Count of Provence proclaimed his nephew King of France, as Louis XVII., and on the death of the Prince in 1795 he assumed the title of King. The events of subsequent years compelled him frequently to change his place of abode. He lived by turns in Germany, Courland, Poland, and Sweden, till at last, in 1807, he found a refuge in England, and purchased a residence—Hartwell, in Buckinghamshire, where his wife died in 1810, and where he remained till the fall of Napoleon opened the way for him to the French throne. He landed at Calais on April 26, 1814, and entered Paris, after twenty-three years' exile, on May 3d, and the nation received the constitutional charter from his hands on June 4th. (See France.) The conduct of the Government, however, was far from being constitutional or liberal. The nobles exercised an influence over the King which led to severe treatment of the adherents of the Empire. (See White Terror.) Then followed Napoleon's return from Elba, when the King and his family fled from Paris, remained at Ghent till after the battle of Waterloo, and in July, 1815, returned to Paris. Louis issued from Cambrai a proclamation in which he acknowledged his former errors, and promised a general amnesty to all except traitors. Again, however, he followed in many things the counsels of the party which detested all the fruits of the Revolution. The party struggle was bitter between the fanatical Royalists on the one hand and those who desired a true parliamentary government on the other. The King succeeded in satisfying neither side, and the struggle was still in progress when this feeble monarch died. The head of the Ministry during the greater part of the reign was the Duc de Richelieu, a man whose character won him the respect of the nation. The France of the Restoration lent itself to the policy of the Holy Alliance, and the year 1823 witnessed the invasion of Spain by a French army, sent to reëstablish the tyrannical sway of Ferdinand VII. Consult the Memoirs of Vitrolles (1883), Broglie (1886), Barante (1890), Basquier (1893), Villèle (1890), and Hyde de Neuville (1889); also Dulaure and Anguis, *Histoire de la révolution depuis 1814 jusqu'à 1830* (Paris, 1834-38); Daudet, *Histoire de l'émigration* (ib., 1886); Viel-Castel, *Histoire de la restauration* (ib., 1860 et seq.).

LOUIS I. (Ger. **LUDWIG**) (1753-1830). First Grand Duke of Hesse-Darmstadt, born at Prenzlau, son of the Landgrave Louis IX. He succeeded his father as Landgrave in 1790, received in 1803 the Duchy of Westphalia and part of the old See of Mainz as compensation for his losses on the farther side of the Rhine, and entered the Confederation of the Rhine as a grand duke in 1806. He joined the Allies in 1813, and became a member of the Germanic Confederation in 1815. In 1820 he granted a constitution to his people, and upon his death, ten years afterwards, was succeeded by his son, Louis II.

LOUIS III. (1387-1436). An Elector of the Palatinate, son of King Rupert. He acted as Regent during his father's absence in Italy (1401), and became Elector in 1410. Louis took a prominent part in the election of Sigismund, and was long a devoted defender of his ecclesiastical policy, which he advanced at the Council of Constance. Afterwards he joined the opposition to the Emperor. He greatly assisted the growth of the University of Heidelberg and left his library to that institution. Louis IV., his son, succeeded him and ruled till 1449.

LOUIS I. (Port. **LUIZ**) (1838-89). A King of Portugal, son of Ferdinand of Coburg and Maria II. da Gloria. He held the title of Duke of Oporto while Pedro was Crown Prince and King, and succeeded him in 1861. He married Maria Pia, daughter of Victor Emmanuel of Italy, in 1862. Louis attempted to promote various reforms, and in 1868 abolished slavery in the Portuguese colonies. His reign, however, was one of party strife, in a great measure fruitless of results, with violent ministerial changes. Among the ministers who wielded power were Saldanha, Pereira de Mello, and Castro. In its colonial policy the Government showed some vigor.

LOUIS II., THE SPRINGER (1042-1123). Landgrave of Thuringia and son of Louis I., 'The Bearded,' who founded the Thuringian House. He was a fairly constant supporter of the Emperor Henry IV., and founded the Wartburg and several other cloisters, one of which he entered as a monk toward the end of his life. According to the legend, he fell in love with Adelheid of Saxony, killed her husband, and married her. The murdered man's friends captured him in the Castle Giebichenstein, near Halle, but by a wonderful leap he managed to escape from them, and thereby earned his nickname. He was succeeded by his eldest son, Louis III., and the latter by his son, Louis IV.

LOUIS, ORDER OF. A French order with three classes founded by Louis XIV. in 1693 for military service. It was dissolved at the Revolution, was restored by Louis XVIII., and ceased to exist in 1830.

LOUISA (LUISE AUGUSTE WILHELMINE AMALIE), Queen of Prussia. See LUISE.

LOUISA, ORDER OF. A Prussian order, founded in 1814 by King Frederick William III. in memory of Queen Louisa, and conferred for distinguished patriotism and humanity. Its membership of 100 was limited to Prussian subjects. In 1850 it was revived as a distinction for women who had rendered notable service in the care of the wounded in 1848 and 1849. It was again bestowed for similar services in 1865, 1866, and 1871.

LOUISA ULRICA, lōō-ē′zȧ ụl-rē′kȧ (1720-82). Queen of Sweden, sister of Frederick the Great. She was born in Berlin, and married in 1744 the Crown Prince Adolphus Frederick of Sweden, who ascended the throne in 1751. She was a woman of rare intelligence, but was overbearing, and rashly spurred on her feeble husband to assert his power in opposition to the estates of the realm. Through her influence the great botanist Linnæus was enabled to publish his system, and the Academy of Belles-Lettres and History and the Museum at Stockholm were founded.

LOUISBURG, lōō′ĭs-bûrg. A town on the Atlantic coast of Cape Breton Island, commanding the entrance to the Gulf of Saint Lawrence, a position which gave it great importance during the French and English wars of the eighteenth century. Cape Breton Island was secured to the French by the Peace of Utrecht in 1713, and the French Government at enormous expense erected a formidable fortress, inclosing and commanding an excellent harbor. This post served as a rendezvous for French fleets and French privateers and was a source of ever-threatening danger to the New England fishermen on the Banks. So great was this menace that, in 1745, Governor Shirley of Massachusetts was able to induce the Assembly of that Colony to undertake the reduction of the post. A force of some 3600 men (the great majority of whom were from Massachusetts), under the leadership of Col. William Pepperell, escorted by a fleet of 100 New England vessels, was joined by a British squadron under Commodore Warren, and the undertaking was carried to a triumphant conclusion. Louisburg was invested April 30, 1745, and its garrison of 1600 men surrendered on June 17th. In 1748, however, by the terms of the Treaty of Aix-la-Chapelle, Louisburg again became the property of France. Ten years later, in 1758, the town was invested by a force of 14,000 men under General Amherst and captured. Since that time it has been a part of British America. While under the French dominion, Louisburg was a flourishing centre for the fishing trade. Under English government the place has dwindled into insignificance, and its capacious harbor is used simply as a stopping-place for steamships. Besides the histories of Cape Breton, much valuable material relating to the siege of Louisburg has been published in the annual volumes of the Society of Colonial Wars.

LOUIS-D'OR, lōō′ĭ-dôr′ (Fr., golden Louis). A gold coin which was introduced into France in 1641, and continued to be coined till 1810. Its milled edges were intended to prevent clipping and paring. The louis-d'or ranged in value from about $4.00 to $4.50, while demi-louis and double-louis were also frequently issued. Some louis-d'or bear special names, chiefly derived from the figure exhibited on the obverse side. In some parts of Germany the larger gold pieces, of five thalers or thereabouts, were often popularly called *louis-d'or,* and the name was also occasionally applied to the French *napoléon,* or 20-franc piece.

LOUIS FREDERICK CHRISTIAN, Prince, usually called LOUIS FERDINAND (1772-1806). A Prince of Prussia, son of Prince Ferdinand, a brother of Frederick the Great; an able and brave but eccentric man. He took part in the Rhine campaign of 1792, commanded the vanguard of Hohenlohe's corps in 1806, and, despite orders, fought a battle at Saalfeld on October 10, 1806, in which he was killed.

LOUISE OF SAVOY (1476-1531). Duchess of Angoulême, and later Regent of France. She was the daughter of Philip, Duke of Savoy, and was born at Pont d'Ain. At the age of twelve she married Charles, Count of Angoulême, and became the mother of Marguerite of Angoulême (1492) and of Francis I. (1494). Her husband died in 1496. By the decision of the States-General (1506), Francis married Claude, daughter of Louis XII., whom he succeeded in 1515. His mother became Regent during his absence in Italy. When the expedition returned she refrained from any open show of authority, but still molded the King to suit her desires. Her treatment of the Constable de Bourbon (see BOURBON, CHARLES) caused the desertion of that able general to the side of Charles V. She became Regent again on Francis's return to Italy, and after the disaster of Pavia (1525) made an alliance with the Swiss and with Henry VIII. She negotiated the Peace of Cambrai with Margaret of Austria in 1529 (the so-called Ladies' Peace). Her Journal has been published in the collection of memoirs. Consult De Maulde, *Louise de Savoie et François I.* (Paris, 1895).

LOUISEVILLE, or RIVIÈRE DU LOUP, rē′vyâr′ dụ lōō (en haut). The capital of Maskinongé County, Quebec, Canada, on Lake Saint Peter, and the Canadian Pacific Railway, 20 miles west of Three Rivers. Tanneries constitute its chief industry. The neighboring Saint Léon mineral springs are much frequented as a health resort. Population, in 1891, 1740; in 1901, 1655.

LOUISIADE (lōō-ē'zē-ăd') **ARCHIPELAGO.** A group of islands in Oceanica, situated at the southeastern extremity of British New Guinea, to which it belongs (Map: Australasia, H 4). It consists of three large islands—Saint Aignan, Southeast Island, and Rossel; each with an area of from 100 to 300 square miles—and numerous small islets and reefs. The large islands are mountainous, having peaks which rise to a height of over 3000 feet, while the islets are chiefly of coral formation. The group is inhabited by savages of Papuan race. The islands were discovered by Torres in 1606, and taken by the British in 1888.

LOUISIANA, lōō-ē'zē-ä'nȧ *or* -ăn'ȧ (named as a colony in honor of Louis XIV. of France). One of the Gulf States of the American Union. It is on the lower course of the Mississippi River, and includes the great delta within its limits. It lies between the parallels of 29° and 33° N. latitude; it extends on the east to longitude 89° W. and its westernmost part lies just beyond longitude 94° W. It is bounded on the north by the State of Arkansas. Its eastern boundary is mainly Mississippi, following the Mississippi River to latitude 31° N., running east on this parallel to Pearl River, which it follows to its mouth in Lake Borgne; farther south it has the Gulf of Mexico on the east. The Gulf washes its entire southern margin, and Texas bounds it on the west. The western boundary follows Sabine Lake and River to latitude 32° N., thence it extends due north to latitude 33°. The State has an area of 48,720 square miles, of which 3300 square miles is water. Of the water area 1700 square miles is made up of inland lakes, 1060 square miles of land-locked bays, often called lakes, and 540 square miles of river surface.

Topography. The highest ridges, in Claiborne and Union parishes, rise to 500 feet above the sea. The land slopes almost imperceptibly to the southeast. The bottom lands of the Mississippi River at the Arkansas line have an elevation of 130 feet, at Natchez 66 feet, at Baton Rouge 34 feet, at New Orleans 15 feet. The average elevation of the State is only about 75 feet above sea level. All the rivers have flood plains of generous width, more or less liable to inundation at times of high water. These bottom lands, in the case of the Red and Ouachita (Washita) rivers, average 10 miles in width; on the Mississippi River, from 10 to 60 miles. Through these flood plains the rivers meander on a decreasing gradient, constantly depositing their loads of silt. This results in building up their beds, until the river flows at the summit of a ridge. From the river edge the land slopes away with a gentle gradient of about seven feet in the first mile, then with only six inches per mile to the marshes and bayous of the outer margin of the flood plains. These river margins furnish a soil of inexhaustible fertility and are largely utilized for plantations of cotton and sugar cane. They are protected from overflow by artificial banks or levees of varying height, there being over 1500 miles of such levees in Louisiana. Occasionally at times of great flood the levees give way in places, the 'crevasse' allowing the river to overflow the adjacent bottoms and carrying destruction far and wide. The Gulf margin extending about sixty miles inland consists of a marshy plain, the only land being the raised river margins and occasional small patches of prairie and live-oak ridges, the prairie area increasing to the west. This lowland and the river bottoms cover an area of 19,200 square miles, or a little less than one-half the area of the State.

The principal rivers are the Mississippi, which flows 600 miles through the State and along its borders, the Red, Ouachita, Sabine, and Pearl; and all of these are navigable at all stages of water. Most of the large rivers of the lowland region are distributaries of the Mississippi and Red rivers, locally called bayous, and nearly all are navigable. They interlace all over the area in the most bewildering fashion. The most important ones are Atchafalaya Bayou, Bayou la Fourche, and Bayou Bœuf. These bayous are very active in taking off the excess water in time of flood.

The lakes are of three classes: First, those of the coastal margin—Pontchartrain, Borgne, Maurepas, Sabine, and many others; they are merely parts of the submerged coastal plain which have escaped filling by delta action. They have salt or brackish water and their level rises and falls with the tide. Second, a host of crescent lakes, oxbow lakes as they are called, which are the unfilled portion of amputated and abandoned meanders. They are usually connected with the river at the lower end by a bayou. The third class of lakes is found in the tributaries of the Red River in the vicinity of Shreveport, and are due to the more rapid silting up of the channel of the master stream than of its tributaries, thus drowning the lower courses of the lateral streams. The main body of the delta proper of the great river extends about seventy miles beyond the general trend of the Gulf coast, while the remoter passes advance about 35 miles still farther into the Gulf.

The great delta is rapidly advancing into the Gulf, depositing in excess of the waste of the waves and of a possible sinking of the immediate region, and it gives promise of annexing the Mobile system in the immediate geologic future. The rapid silting in the passes leaves a maximum depth at the outer bar of only twelve feet, though the main river has a depth of 100 feet from the mouth of the Red River down to the passes. Capt. J. B. Eads was appointed by the Government in 1875 to construct artificial banks or jetties in the passes, narrowing the stream and compelling it to corrade a deep channel and to keep it open. It was a complete success, a thirty-foot channel having been maintained ever since, so admitting vessels of the largest class to the port of New Orleans.

Climate. The State enjoys a semi-tropical climate, and the proximity to the Gulf makes its climate remarkably equable. The cyclonic storms of temperate latitudes travel for the most part to the west and north, making the prevailing winds south and southwest, so carrying the tempering influence of the Gulf over the State for the most of the year. Occasional anti-cyclonic areas, however, bring north and northwest winds, varying the humidity and temperature widely. The average temperature for January is 60° F. in the delta and 45° at Shreveport. The absolute minimum temperature brings zero F. to the northwest corner of the State, thus giving a range of over 100° in temperature. The earliest killing frost comes on the average to the latitude of Shreveport November 1st, to the middle of the State November 15th, to New Orleans December 1st. The average date of the latest hard frost is February 1st for the latitude of Baton Rouge, and March 1st for Shreveport, thus leaving the State on the average nine months free from frost. The precipitation exceeds 60 inches in the delta region, falling to 50 inches in the northern part. It is quite evenly distributed throughout the year. New Orleans shows a maximum in June, July, and August, and a minimum in October, while Shreveport has a slighter maximum in April and a lower minimum in August. Rain falls on the average 105 days in the year, over an area extending from Shreveport to Vicksburg, while 100 days is the average for the rest of the State. The sky is clouded 50 per cent. of the winter season and 40 per cent. of the summer.

The climatic conditions invite a very luxuriant vegetation, in which most of the warm temperate species are found, and in addition a large number of subtropical species, both herbaceous and arborescent. The swamps are filled with cypress trees, making a very valuable source of lumber. Many varieties of oak, including the live oak, as well as the sweet gum, tulip, black walnut, long-leaf pine, short-leaf pine, and cedar, abound, and trees are draped in Spanish moss. Roses, magnolias, oleander, and jasmine grow in profusion, and the list of fruit trees includes the orange, lemon, olive, fig, peach, and plum. For *Flora* and *Fauna* see these sections in the article UNITED STATES.

GEOLOGY. The entire State lies in the great Mississippi Gulf which in Cretaceous time extended to Cairo, and hence it is included in the coastal plain of recent geologic age. The oldest formation is Cretaceous, which is found only in a few outlying islets on the margin of the general plain of nearly horizontal Tertiary beds in the northwestern corner. The southeastern four-fifths of the area of the State consists of Miocene and later deposits in beds shelving gently seaward. The valley of the Red River from Shreveport down, an average of 40 miles in width, is alluvium of an age from Pliocene to recent. This is also true of the flood plain of the Mississippi River, which at the northern boundary has an extreme width in Louisiana and Mississippi of over 100 miles. A belt of the same alluvium extends westward from the Mississippi River through Avoyelles, Rapides, and Vernon parishes into Texas. The upper members of the Tertiary beds of clay stones and clay sandstones form a well-marked hilly upland region, extending northeast from the northern edge of Vernon Parish. Over most of the Tertiary area, calcareous marls and limestones give open prairies of rich soil. The Cretaceous outcrops are the red lands of the State.

MINERAL RESOURCES. The only minerals of importance in the State are rock salt and petroleum. The former occurs in rich deposits on Petite Anse Island, in the Parish of Iberia, in the marshes of the coast. The product is wholly mined rock salt of fine quality. The output in 1895 was 159,775 barrels of 280 pounds, and in 1897 this had increased to 209,393 barrels.

The potable waters of the highlands are usually hard in the limestone regions, and often are fetid where found in the dark clays and lignites.

Southwestern Louisiana shares with the neighboring Texas region in the possession of oil fields. A number of productive wells have been obtained, giving much promise of the future commercial value of the State's oil resources.

FISHERIES. Louisiana ranks second among the Gulf States in the total value of its fisheries. The last year for which a record has been obtained for the industry (1897) showed a slight increase over 1890, the value of the product for the former year being estimated at $713,587. There were in 1897 4403 men engaged in the industry, most of them on the 'inshore or boat fisheries.' The oyster fisheries are the most valuable on the United States coast south of Virginia, the yield having been worth (1897) $432,668. The oyster reefs extend almost continuously along the southern coast, from the border of the State of Mississippi to the mouth of the Atchafalaya River. The seine fishery, which is tributary to New Orleans, is of less importance than formerly, although the chief variety, shrimp, is taken in larger quantities than in ony other State. The trot-line fishing for catfish is also the most extensive in the United States. In many districts the supply of alligators is becoming exhausted, and the catch is decreasing. Though the value of the hide has greatly increased, the annual amount received for the total catch remains about constant.

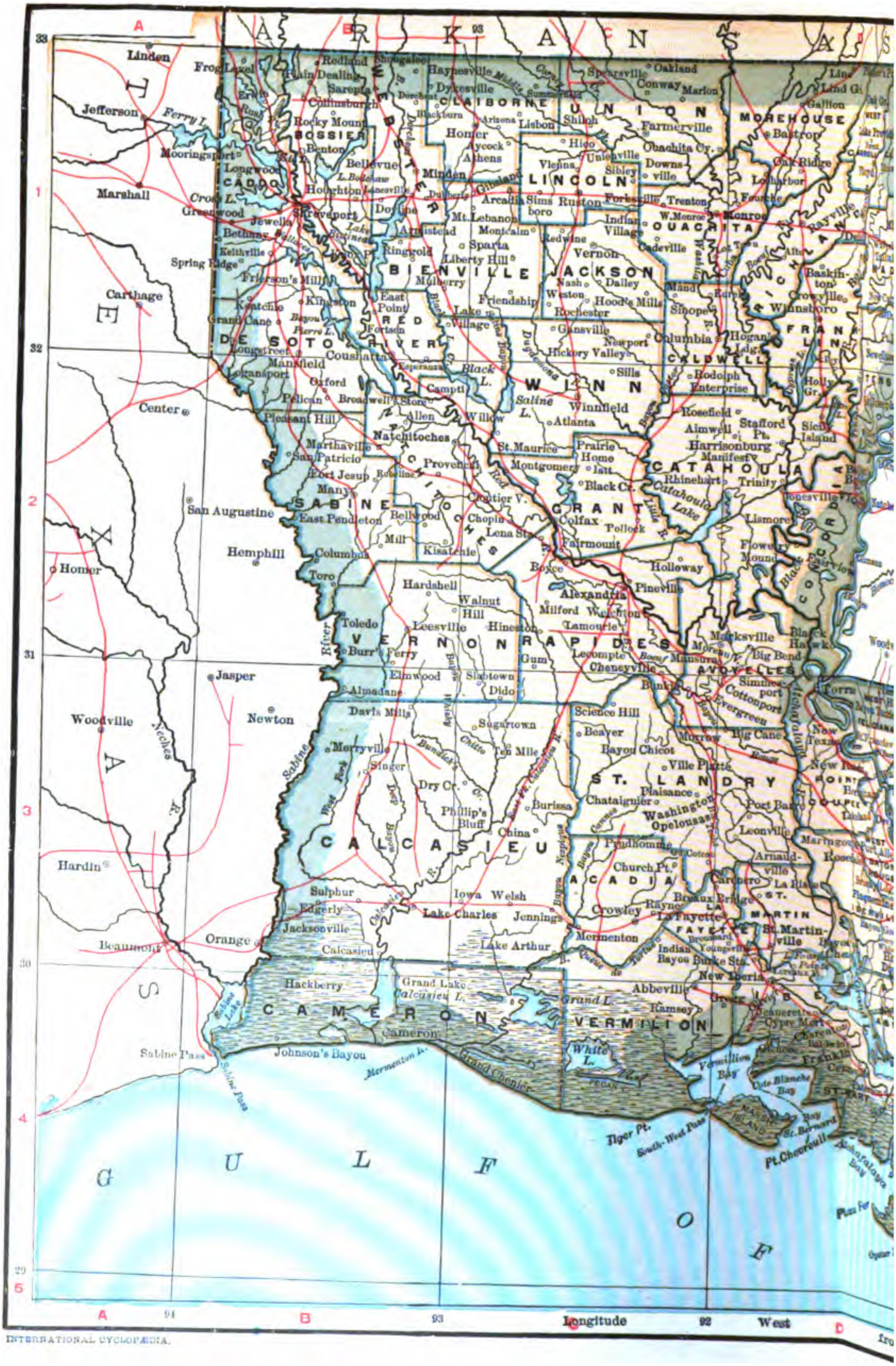
AGRICULTURE. Louisiana is exceptionally favored by the nature of its soil, rainfall, and temperature for the luxuriant growth of vegetation and the success of agriculture. The only uncultivable land is found in the region of the coast marshes, but even these afford fine pasturage. The alluvial soils of the river valleys are noted for their inexhaustible fertility. In 1900 the acreage included in farms was 11,059,127 acres, or 38 per cent. of the area of the State. This was a decided increase over all earlier decades. As compared with 1860, the increase in farm acreage since that year has been wholly in the percentage of farm land improved, which was increased from 29.1 per cent. in 1860 to 42.2 per cent. in 1900. As was true throughout the South, agricultural interests in Louisiana suffered a severe blow from the Civil War, and the slow recovery was attended by a change in the agricultural system. Especially noteworthy are the breaking up of the large plantations and the increase in the renting of farms. The average size of farms has decreased steadily from 536 acres in 1860 to 95 acres in 1900.

However, certain of the State's products are much more economically produced on a large scale, and the plantation system of cultivation is probably more extensive in Louisiana than in any of the other Southern States. In 1900 there were 1050 farms which exceeded 1000 acres in area, and the average per acre value of the products ($4.96) was greater than it was for the farms having between 100 and 1000 acres.

The increase in renting is due largely to the increased number of negroes who undertake farming on their own account. The number of colored renters is over two and one-half times as great as that of the white renters, while the number of colored farmers is less than one-quarter the number of white owners. In 1900, 25 per cent. of the farms were operated by cash tenants and 33 per

AREA AND POPULATION OF LOUISIANA BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Acadia	C 3	Crowley	633	13,231	23,483
Ascension	E 3	Donaldsonville	310	19,545	24,142
Assumption	D 4	Napoleonville	485	19,629	21,620
Avoyelles	D 2	Marksville	850	25,112	29,701
Bienville	B 1	Arcadia	832	14,108	17,588
Bossier	B 1	Benton	832	20,330	24,153
Caddo	B 1	Shreveport	906	31,555	44,499
Calcasieu	B 3	Lake Charles	3,629	20,176	30,428
Caldwell	C 1	Columbia	557	5,814	6,917
Cameron	B 4	Cameron	1,445	2,828	3,952
Catahoula	C 2	Harrisonburg	1,399	12,002	16.351
Claiborne	B 1	Homer	764	23,312	23,029
Concordia	D 2	Vidalia	707	14,871	13,559
De Soto	B 1	Mansfield	864	19,860	25,063
East Baton Rouge	D 3	Baton Rouge	451	25,922	31,153
East Carroll	D 1	Lake Providence	395	12,362	11,373
East Feliciana	D 3	Clinton	454	17,903	20,443
Franklin	D 1	Winnsboro	616	6,900	8,890
Grant	C 2	Colfax	700	8,270	12,902
Iberia	D 4	New Iberia	583	20,997	29,015
Iberville	D 3	Plaquemine	643	21,848	27,006
Jackson	C 1	Vernon	574	7,453	9,119
Jefferson	E 4	Gretna	413	13,221	15,321
Lafayette	C 3	Lafayette	259	15,966	22,825
Lafourche	E 4	Thibodau	981	22,095	28,882
Lincoln	C 1	Ruston	465	14,753	15,898
Livingston	E 3	Springville	626	5,769	8,100
Madison	D 1	Tallulah	666	14,135	12,322
Morehouse	D 1	Bastrop	809	16,786	16,634
Natchitoches	B 2	Natchitoches	1,275	25.836	33.216
Orleans	F 3	New Orleans	197	242,039	287,104
Ouachita	C 1	Monroe	646	17,985	20,947
Plaquemines	F 4	Pointe a la Hache	978	12.541	13.039
Pointe Coupee	D 3	Newroads	576	19,613	25,777
Rapides	C 2	Alexandria	1,370	27,642	39.578
Red River	B 1	Coushatta	401	11,318	11,548
Richland	D 1	Rayville	546	10,230	11,116
Sabine	B 2	Many	1,029	9,390	15.421
St. Bernard	F 4	St. Bernard	721	4,326	5,031
St. Charles	E 4	Hahnville	300	7,737	9,072
St. Helena	F 3	Greensburg	409	8,062	8,479
St. James	F 3	Convent	280	15,715	20,197
St. John the Baptist	E 2	Edgard	209	11,359	12,330
St. Landry	C 3	Opelousas	1,662	40.250	52,906
St. Martin	D 3	St. Martinville	493	14.884	18,940
St. Mary	D 4	Franklin	658	22,416	34,145
St. Tammany	E 3	Covington	874	10,160	13,335
Tangipahoa	E 3	Amite	777	12,655	17,625
Tensas	D 2	St. Joseph	665	16,647	19.070
Terrebonne	E 4	Houma	1,790	20,167	24,464
Union	C 1	Farmerville	888	17.304	18,520
Vermilion	C 4	Abbeyville	1,246	14,234	20,705
Vernon	B 2	Leesville	1,321	5,903	10,327
Washington	E 3	Franklinton	638	6,700	9,628
Webster	B 1	Minden	682	12,466	15,125
West Baton Rouge	D 3	Port Allen	236	8,363	10,285
West Carroll	D 1	Floyd	362	3,748	3,685
West Feliciana	E 3	St. Francisville	386	15,062	15,994
Winn	C 2	Winnfield	957	7,082	9,648



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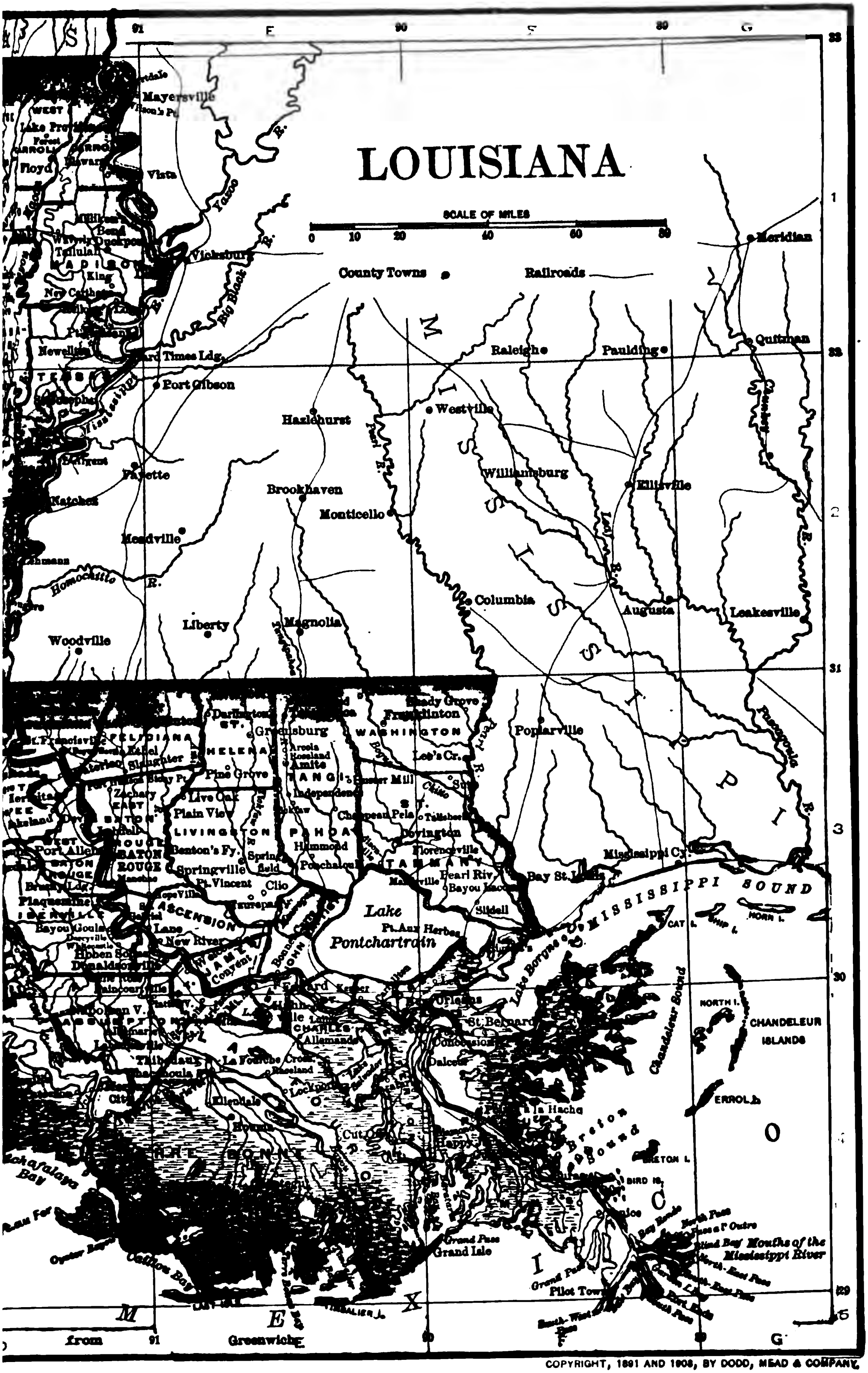

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cent. by share tenants. The acreage operated by the colored farmers was 21.2 per cent. of the total, but less than 10 per cent. was actually owned by them.

Louisiana ranks below most of the Southern States in the production of the two leading crops of that region—cotton and corn. The acreage of these two crops is about the same, but the cotton crop is estimated at more than twice the value of the corn, and is of first importance in the State. The production of cotton, in pounds, was almost the same in 1899 as in 1859. The acreage of corn increased 60.4 per cent. in the last decade of the nineteenth century, and in the last census year amounted to 93.5 per cent. of that of the total cereal crop. The sugar-cane and rice culture of the United States is largely localized in Louisiana. The sugar crop rivals cotton in value, although the acreage devoted to it is incomparably smaller. This industry had become extensive by the middle of the nineteenth century, but after that period did not increase greatly until the last decade of the century. A very considerable portion of the crop in Louisiana must annually be kept for seed. This is not the case in Cuba or Hawaii. Louisiana is thus placed at a decided disadvantage in competition. The heavy expenditure incurred in the machinery required to conduct a sugar plantation successfully results in the establishment of large estates, the average size being much greater than that of farms which are primarily devoted to any other crop. In 1899, 56.7 per cent. of the crop was grown under the immediate management of the manufacturer, 8.6 per cent. on plantations by tenants, and 34.7 per cent. by others—the two last classes selling the harvested product to the manufacturer. Much damage occasionally results to the sugar crop from frosts.

The rice-growing industry had its period of greatest increase in the last five years of the nineteenth century. The delta parishes were formerly the most important rice-growing region, but they have recently been largely given up for the prairie coast region west of the delta. The parishes of Acadia, Calcasieu, and Vermilion in 1889 contributed 68.3 per cent. of the crop, although in 1889 they had produced only 23.5 per cent. This change in the region of rice production resulted from the difficulty in using heavy modern machinery in the delta district, owing to the soft alluvial soil, and to the discovery that the prairie soil was unequaled for rice-growing. Heavy irrigation is required, and this is easily obtained on the prairies of Louisiana. Canals are constructed along the higher ridges of land, and pumping plants at the head of the canals lift the water from the streams. The region is underlaid with water-bearing gravel, so that water is also secured from wells. The crop is harvested the same as wheat in the Northwest.

In 1889, 63,098 acres were devoted to vegetables, 43.4 per cent. of which was in sweet potatoes. Peas are grown to some extent, and in the last decade of the nineteenth century there was a very significant increase in the cultivation of peanuts, but the area devoted to them is still small. Comparatively little attention is given to fruit. Of the 1,168,792 trees in 1900, 64.9 per cent. were peach trees, the number of which had much more than doubled in the decade ending with that year. Ninety-nine per cent. of the area devoted to small fruits was in strawberries. The following figures show the acreage of the leading crops for the census years indicated:

	Cotton	Sugar cane	Corn	Rice	Oats	Hay and forage
1900	1,376,254	276,966	1,343,756	201,685	28,033	97,136
1890	1,270,154	193,694	837,516	84,377	27,023	27,576

STOCK-RAISING. As is usual in a region where so little attention is given to cereals, stock-raising is of small importance. The number of horses on farms was, however, considerably more than twice, and the number of mules and asses more than three times, as great in 1900 as in 1850, and the increase in each of these was especially marked in the last decade of that period. The increase was much less for other varieties of domestic animals, although the number of dairy cows has increased rapidly since 1870, and milk and butter have become important sources of income.

The following table shows the number of domestic animals on farms, as reported by the censuses of 1890 and 1900:

	Dairy cows	Other cattle	Horses	Mules and asses	Sheep	Swine
1900	184,816	485,480	194,372	144,653	169,234	788,425
1890	167,223	413,880	126,777	88,028	186,167	659,935

MANUFACTURES. The value of manufactured products in Louisiana more than doubled in each of the last two decades of the nineteenth century. The total value of the product in 1900 was estimated at $121,181,000. The number of wage-earners increased from 12,160 in 1880 to 42,210 in 1900, or from 1.3 per cent. of the population to 3.1 per cent.

The sugar-cane, cotton, and rice fields supply the raw materials for the most important group of manufactures. The sugar and molasses refining products amount to 39.5 per cent. of the total value of the products of the State. The loss formerly sustained through the enforced idleness of the plants for a long period each year is now being obviated through the utilization of the machinery in the manufacture of paper from the waste product or woody fibre of the cane. Another flourishing industry is the manufacture of cottonseed oil and cake, which made a gain of 346 per cent. during the decade. While there were only two factories manufacturing cotton goods, there were a number of others in process of erection. The cleaning and polishing of rice, the manufacturing of foundry and machine-shop products, tobacco products, and of bags, are other important industries. Over one-half of all the products are accredited to New Orleans.

The following table shows the recent growth and tendencies of the eight leading industries:

INDUSTRIES	Year	Number of establishments	Wage-earners, average number	Value of products, including custom work and repairing
Total for selected industries for State	1900	998	22,306	$87,181,916
	1890	273	7,904	28,272,588
Increase, 1890 to 1900	......	725	14,402	$58,909,328
Per cent. of increase	......	265.6	182.2	208.4
Per cent. of total of all industries in State	1900	22.9	52.8	71.9
	1890	10.4	27.9	48.9
Sugar and molasses, refining	1900	384	6,504	47,891,691
	1890	88	1,963	12,608,913
Oil, cottonseed and cake	1900	24	1,317	7,026,452
	1890	7	387	1,573,626
Rice, cleaning and polishing	1900	37	412	5,736,451
	1890	16	355	4,009,901
Cars and general shop construction and repairs by steam railroad companies	1900	19	1.378	1,429,099
	1890	6	61	112,847
Foundry and machine-shop products	1900	69	1,318	2,672,761
	1890	49	1,095	2,151,586
Bags, other than paper	1900	5	330	3,443,468
	1890	3	89	669,945
Lumber and timber products	1900	432	10,171	17,408,513
	1890	127	3,311	5,745,194
Lumber, planing-mill products, including sash, doors, and blinds	1900	28	881	1,578,481
	1890	27	643	1,405,576

Forests. The Louisiana forests are exceeded in area and value by those of but few States. The most valuable variety is the long-leaf pine, which extends in the southwest from the Red River bottom to the coast prairies, and in the upper eastern part of the State the same species covers an almost equal area. The growth of this timber is remarkably heavy. The manufacture of long-leaf pine products is centred in Lake Charles. There are also very extensive areas of short-leaf pine, intermixed with deciduous varieties. The twelfth census reports that steps are being taken that will result in the marketing of hard woods on an enormous scale. The table above shows the progress that was made in the lumber industry in the last decade of the nineteenth century. The dense and heavy cypress forests in the deltaic region as yet have been scarcely touched.

Transportation and Commerce. Louisiana is exceptionally well favored in its facilities for water transportation. It claims a greater mileage—3771 miles—of navigable streams than any other State of the Union. These afford competition with the railroads of the State and thus have a very beneficent effect upon transportation rates. A canal constructed from the Mississippi River to Lake Borgne greatly shortens the passage from New Orleans to the Gulf. (For Mississippi improvements, see Mississippi River.) Railroads were slow in developing in the State, and in 1880 there were only 652 miles, but this was increased during the following decade to 1739, and in the decade 1890-1900 to 2801 miles. Louisiana has become the objective point for a number of the leading Southern railroads. The lines having the greatest mileage within the State in 1900 were those operated by the Southern Pacific Company, the Texas and Pacific Company, and the Kansas City, Pittsburg and Gulf Company. Louisiana has a railroad commission which has oversight also of water routes. It is authorized "to adopt, change, or make reasonable rates, charges, and regulations, to govern and regulate railroad, steamboat, and other water craft, prevent unjust discrimination in rates," etc. The State is divided into three railroad commission districts, and one commissioner is elected from each district. The decisions of the commission have seldom been reversed.

The port of New Orleans is the most important one on the southern coast of the United States, and is exceeded only by New York and Boston in the amount of its foreign trade. For the year ending June 30, 1902, the value of the imports amounted to $20,462,307, and the exports to $152,776,599.

Banking. The State enacted an important banking law in 1842, which required a specie reserve equal to one-third of all its liabilities to the public. The remaining two-thirds was to be covered by commercial paper maturing in ninety days. The banks were to be examined by a board of State officers at least once in three months. Furthermore, the bank directors were individually held liable for all loans and investments made in violation of the law unless it could be proved that they had voted against such investments in session. The law was very successful in its operation. The State in 1860 ranked fourth in amount of banking capital and second in specie holdings. In requiring a definite amount of specie to be kept in reserve, the act marked a new era in banking. This, with other of its more important provisions, served as a foundation for the systems established by other States. The banks of New Orleans are noteworthy for the honorable way in which they met their Northern obligations at the outbreak of the Civil War. In 1892 there were 29 national banks in the State, whose loans aggregated $21,636,000; cash and sight exchange, $2,323,000; capital, $3,549,000; surplus, $3,381,000; circulation, $1,747,000; and deposits, $23,047,000. On June 30, 1902, there were 80 State banks with loans and discounts (not including those on real estate and collateral security) aggregating $16,753,448; cash, $2,466,731; capital, $4,612,050; surplus fund, $852,386; and deposits, $23,980,553. In 1899-1900 there were 10,518 depositors in savings banks, with an average deposit of $312.31 each.

Finance. The power of the Legislature to create debt is restricted to the purposes of repelling invasion or suppressing insurrection. The State property tax is limited to six mills on the dollar of the assessed valuation. A poll tax of one dollar is levied upon male inhabitants between the ages of twenty-one and sixty years. The total receipts of the treasury for the year ending December 31, 1902, were $4,160,067, of which $1,412,805 was a balance on hand at the beginning of the year. The items productive of the greatest revenue are direct taxation and licenses on occupations. The funded debt at the end of the year was $11,108,300, and the unfunded debt, $1,157,002.

Population. The following figures indicate the growth of the population: 1810, 76,566; 1820, 153,407; 1830, 215,739; 1840, 352,411; 1850, 517,762; 1860, 708,002; 1870, 726,915; 1880, 939,946; 1890, 1,118,587; 1900, 1,381,625. The rank of the State in 1900 was twenty-third. The largest absolute gain was made in the last decade of the nineteenth century, amounting to 23.5 per cent., as compared with 20.7 for the United States. Louisiana is the only one of the States in which the French figured prominently in the early settlements. The descendants of these constitute a large element in the present population. Since the Civil War there has been a large immigration from other parts of the country—particularly from the Northern States. The foreign-born population is not large, having been, in 1900, 52,903. The State ranks sixth in the number of its negro population, which in 1900 amounted to 650,804. The rate of increase for the negroes during the last decade of the nineteenth century was much less than it was for the whites. In 1900 there were 30.4 inhabitants to the square mile.

Cities. The population of the three largest cities in 1900 was as follows: New Orleans, 287,104; Shreveport, 16,013; Baton Rouge, the capital, 11,269.

Religion. Slightly over one-half of the Church communicants are Catholics. The State thus presents a striking contrast to the other Southern States, since it is the only one in which the Catholics have a large representation. The Protestant membership belongs mainly to the two dominant churches of the South—the Baptists and Methodists.

Charitable and Penal Institutions. The Governor and six persons appointed by him constitute a board of charities and corrections, but their duties are strictly visitorial without administrative or executive powers. The Constitution forbids State donations to any private charitable or benevolent agency. The new Constitution put a stop to the old system of leasing convicts. These may now be put to labor upon public works, convict farms, or in manufactories owned or controlled by the State. Persons sentenced to the parish jails may be put to work upon public works within the parish. The State institution for the blind and that for the deaf and dumb are each situated at Baton Rouge. Charitable hospitals are maintained at New Orleans and at Shreveport. The State Insane Asylum is located at Jackson.

Education. The educational reports of Louisiana for recent years show that the State is in a fair way of redeeming its educational reputation. The enrollment of white pupils in the public schools increased from 38,870 in 1881 to 125,257 in 1901, the enrollment in the latter year amounting to 63 to every 100 persons between the ages of six and eighteen. During the same period the enrollment of colored pupils increased from 23,590 to 73,624, the corresponding percentage being 40. Moreover, the length of term—120 days—as reported for 1901 was greater than that for any other Southern State, and the term of the colored schools was as long as that for the whites. However, the educational status in a number of parishes is deplorable and the enrollment is exceedingly low. The census for 1900 shows that 61.1 per cent. of the negro population ten years of age and over was illiterate—but a little less than the corresponding percentage in 1880. The illiteracy of the native white population was 17.3 per cent. in 1900. The law of 1902 provides that the State appropriation for education shall be distributed among the parishes of the State according to the number of children between the ages of six and eighteen, but the poll tax should be retained in the parish in which it is collected. Local parish taxes may be assessed by the police jurors for school purposes, subject to certain maximum and minimum limitations. Certain other local receipts in the form of fines are used for educational purposes. In 1901 the total receipts for school purposes was $1,393,892, of which the most important sources were the corporation taxes, $403,185; current school fund, $322,413; police jury tax, $208,446. The disbursement amounted to $1,236,647, of which $983,515 went for teachers' salaries. Inducements are made to teachers to extend their academic courses by allowing graduates from the State Normal, State University, and certain other institutions to teach without passing an examination. In 1901 there were 2384 female and 835 male white teachers, and 541 female and 511 male colored teachers. The average salary of the white males is $42 per month, and of the colored males $26.50 per month. According to the law of 1902 there is a State Board of Education consisting of the Governor, Superintendent of Education, Attorney-General, and one person from each of the seven Congressional districts of the State, appointed by the Governor. This board appoints a board of school directors for each parish, the members of which hold office four years. These directors elect the parish superintendents and fix their salaries within certain limits. The State Board selects a uniform series of text-books.

Higher education is provided by the State at the State University and Agricultural and Mechanical College, located at Baton Rouge; Tulane University; the Industrial Institution at Ruston; the Southwestern Industrial Institute at Lafayette; and the Southern University—colored—at New Orleans. The State exempts from taxation the valuable real estate of Tulane University. This institution, situated at New Orleans, is one of the foremost educational institutions of the South. There are also a number of denominational colleges, most of which are in New Orleans.

Government. The present Constitution was adopted in convention May 12, 1898. To amend the Constitution it was necessary to have the approval of two-thirds of all the members elected to each House, and a majority of the electors voting at a popular election. Voters must have resided in the State two years, in the parish one year, and in the precinct six months. The voter must be able to fill out the application blank for registration as a test of his ability to read and write. If, however, he is a bona fide owner of property assessed at a valuation not less than $300, and the taxes upon it have been paid, the educational qualification cannot bar him from the exercise of the ballot. Neither does it operate against any person who was on January 1, 1867, entitled to vote in any State of the United States wherein he then resided; or against any son or grandson of such person, not less than twenty-one years of age at the date of adoption of the Constitution. Women taxpayers have the right to vote upon questions submitted to the taxpayers as such, in any municipal or other political subdivisions of the State. General State elections are held on the first Tuesday after the third Monday in April; and parochial elections, except for the city of New Orleans, are upon the same day. Louisiana sends 7 members to the National House of Representatives.

Executive. A Governor, Lieutenant-Governor, Auditor, Treasurer, and Secretary of State are elected for terms of four years. The Governor exercises the usual pardoning power under certain limitations. The Governor's veto of a bill or any item of an appropriation bill is overridden by a two-thirds vote of the members elected to each House.

Legislative. Both Senators and Representatives are elected for terms of four years. The number of Senators has a minimum and maximum limit of 36 and 41 respectively, and the Representatives of 98 and 116 respectively. Each parish and each ward of the city of New Orleans shall have at least one Representative. No parish except the parish of Orleans is divided in the formation of Senatorial districts. Members of the Legislature receive $5 per day for attendance and mileage. Revenue bills must originate in the House of Representatives. Impeachment is by the House and trial of impeachment by the Senate.

Judicial. The Supreme Court consists of one chief and four associate justices, all of whom are appointed by the Governor and the Senate for terms of twelve years. There are four Supreme Court districts, two justices being appointed from the district in which New Orleans is situated. The Attorney-General of the State is elected for four years. Since July 1, 1904, the Court of Appeals has been composed of two district judges designated by the Supreme Court. There are from 20 to 29 judicial districts, the District Court judges, as also the district attorney for each district, being elected for nine years.

Local Government. The Legislature cannot create a parish (county) with less than 625 square miles or less than 7000 inhabitants. The changing of parish lines or removing parish seats must be approved by two-thirds of the qualified electors of the parishes affected. See list of parishes on back of map.

Militia. In 1900 there were 268,739 males of militia age, 145,839 of whom were white. In 1898 the organized militia—men and officers—numbered 2693.

History. It is believed that the great river which Alvarez de Pineda, a Spanish explorer, entered in August, 1519, and followed up for some distance, was the Mississippi. Twenty-three years later the survivors of De Soto's expedition, in their overland journey to the Mexican town of Pánuco, must have traversed a large part of the present State. Authentic history begins with the year 1682, when Robert Cavelier de La Salle descended the Mississippi and took possession of the entire valley in the name of Louis XIV., in whose honor he named the region Louisiana. La Salle's attempt to establish a colony in Louisiana ended in disaster and his own death, but in 1698 a second venture was made by Pierre Le Moyne, Sieur d'Iberville (q.v.), under the auspices of the Comte de Pontchartrain. In March, 1699, Iberville ascended the Mississippi for some hundreds of miles, then returned and built a fort at Biloxi and another on the Mississippi about 40 miles above its mouth. Under Iberville and his brothers Sauvolle and Bienville, who succeeded him in the chief command, the colony experienced but a puny growth, for the heat, fever, and lack of food proved fatal. In 1711, when Louisiana was made an independent colony, the number of inhabitants comprised in the group of settlements at Biloxi, Mobile, Cat Island, Ship Island, and the Isle of Dauphin was about 400, of whom the greater number were soldiers. In 1712 Louis XIV. granted to Antoine Crozat, a Paris merchant, the exclusive privilege of trade and mining in Louisiana, for a period of fifteen years. After sinking a large fortune in fruitless attempts to develop the country, Crozat surrendered his charter in 1717, and the region passed into the hands of the Company of the West, headed by John Law (q.v.), who proceeded to engineer his famous Mississippi Scheme. Colonization was actively carried on. Emigrants from Germany and Alsace were settled on the Arkansas and Red rivers, convicts from French prisons were brought over in considerable numbers, and negroes were imported from Africa. New Orleans, which had been founded in 1718, was made the capital in 1722. The growth of the colony was hampered by the restrictive commercial policy of the company and incessant quarrels among the officials. In retaliation for the massacre of the French inhabitants at Fort Rosalie in 1729, warfare was carried on with the Natchez Indians until they were exterminated, but in their operations against the Chickasaws the French were less successful. In 1733 Louisiana came directly under the Crown, and for thirty years led a drowsy existence, and submitted quietly to a succession of inefficient Governors. In 1763 France ceded Louisiana east of the Mississippi (with the exception of the island of Orleans) to England, the vast region west of the river with the city of New Orleans having been ceded to Spain by a secret treaty in the preceding year. The people were dissatisfied with Spanish rule, although it was much better than the French, and in 1768 the inhabitants of New Orleans rose in rebellion. The revolt was put down with effective cruelty by the Spanish General O'Reilly. With the development of the Kentucky and Tennessee regions, whose inhabitants required an outlet for their produce, the free navigation of the Mississippi had become by this time of great importance for the United States. When the Spanish denied the Americans free access to the Gulf, a situation arose which might have led to war, but resulted instead in the purchase of Louisiana from the French by the United States in 1803, Spain having relinquished the region to France in 1800. Louisiana then embraced all the present State of Louisiana west of the Mississippi, Arkansas, Missouri, Iowa, Minnesota west of the Mississippi, the Dakotas, Nebraska, most of Kansas and Indian Territory, and all of Wyoming, Montana, and Colorado east of the Rocky Mountains. In 1804 the region south of latitude 33° was organized as the Territory of Orleans, while the country north became the Territory of Louisiana in 1805, and the Territory of Missouri in 1812.

The State of Louisiana was admitted in April, 1812. (For military operations during the War of 1812, see UNITED STATES.) The economic development of the State was rapid and was accompanied by constitutional changes which harmonized the old civil law with the principles of the common law and republican institutions. In 1845 the choice of a Governor was given directly to the people, and in 1852 many judicial offices were made elective. In the same year Baton Rouge became the capital. On January 26, 1861, a convention passed an ordinance of secession without submitting it to a popular vote. With the outburst of war the commerce of New Orleans disappeared almost entirely, and great want ensued throughout the State. (For military operations in Louisiana, see CIVIL WAR.) In May, 1862, New Orleans was occupied by the Union troops, a military government was established, and the courts were reorganized. In 1864 a convention elected by the loyal element in the State framed a new constitution emancipating negro slaves immediately and unconditionally. By 1866 the State Government had fallen into the hands of the 'conservatives,' who proceeded to legislate against the freedmen, and an attempt made by the Unionists to reconvene the convention of 1864 in order to revise the suffrage requirements led to a riot in the streets of New Orleans (July 30, 1866), in which nearly 200 negroes were killed, while throughout the State negroes and white Republicans were terrorized systematically. On March 2, 1867, Louisiana became a part of the Fifth Military District under General Sheridan, who made full use of his broad authority. In 1868 a new constitution enfranchising the negroes was adopted against the vehement opposition of the 'conservatives,' the Fourteenth Amendment was ratified, and military occupation came to an end in July, 1868. The great mass of white inhabitants were slow in reconciling themselves to the new conditions, and bitter feeling and turbulence marked the strife of parties and factions. In the election of 1872 the Democrats and Liberal Republicans were arrayed against the Radical Republicans. After a close poll, partisan boards of State canvassers declared either ticket elected, and two rival governments were organized, the Democratic Government supported by the State militia, the Republican by the Federal troops. Violence and bloodshed ensued in 1874, and peace was established only in 1875 through the medium of a Congressional committee. In 1876 there was another election dispute; a Republican returning board changed a Democratic majority of 8000 in the State into a Republican majority of 4000—a change which was all the more galling in that the electoral vote of Louisiana was sufficient to secure the election of the Republican candidate for the Presidency. By refusing to continue the policy of Federal intervention in political contests within the State, President Hayes insured the triumph of the Democratic Party, which has remained predominant since 1876. About 1875 was begun the system of river jetties and levees which has been continued at great expense to the State and the Federal Government ever since, and has resulted in the improvement of navigation and the protection of the river banks from disastrous floods. The question of the renewal of the charter of the Louisiana Lottery Company was the chief issue in the hotly contested election of 1891, which went against the company. In 1894 the repeal of the bounty on sugar by Congress occasioned a split in the Democratic Party in the State. After 1895 outbursts of racial feeling were frequent, and the determination of the white inhabitants to wipe out the negro as a political factor became apparent. In 1894-95 there were conflicts between white and negro labor in New Orleans, and in 1896, all through the so-called Black Belt, white men with arms drove negroes from the polls. By the so-called Grandfather Clause in the Constitution of 1898, which laid down the qualification for suffrage, the vast majority of the negroes were disfranchised, so that in 1900, out of 130,000 registered voters, it was estimated only 7000 were colored, though the negro population almost equals the white.

In national politics Louisiana has been Democratic-Republican and Democratic except in 1840 and 1848, when it voted for the Whig candidates, and 1876, when its electoral vote was given by the Electoral Commission (q.v.) to Hayes. In 1864 and 1872 its vote was not counted. The following have been the Governors of Louisiana since its organization as a Territory:

TERRITORY OF ORLEANS

William C. C. Claiborne		1804-12

STATE

William C. C. Claiborne.	Democratic-Republican	1812-16
Jacques Philippe Villeré	" "	1816-20
Thomas B. Robertson	" "	1820-24
Henry Schuyler Thibodeaux (acting)	Dem.-Rep.	1824
Henry Johnson	Democratic-Republican	1824-28
Pierre Derbigny	" "	1828-29
Armand Beauvais (acting)	" "	1829-30
Jacques Dupré (acting)	" "	1830-31
André Bienvenu Roman	Whig	1831-35
Edward D. White	"	1835-39
André Bienvenu Roman	"	1839-43
Alexander Mouton	"	1843-46
Isaac Johnson	Democrat	1846-50
Joseph Walker	"	1850-53
Paul Octave Hébert	"	1853-56
Robert C. Wickliffe	"	1856-60
Thomas O. Moore	"	1860-62
George F. Shepley	Military	1862-64
Henry W. Allen	Governor of Confederate part of State	1864-65
Michael Hahn	Unionist and Military	1864-65
James M. Wells	Democrat	1865-67
Benjamin F. Flanders	Military	1867
Joshua Baker	"	1867-68
Henry C. Warmoth	Republican	1868-73
John McEnery	Democrat and Liberal Republican. Not recognized by President or Congress	1873
William Pitt Kellogg	'Custom House' Republican	1873-77
Stephen B. Packard.	Republican claimant; not recognized	1877
Francis T. Nicholls	Democrat	1877-80
Louis A. Wiltz	"	1880-81
Samuel D. McEnery	"	1881-88
Francis T. Nicholls	"	1888-92
Murphy J. Foster	Anti-Lottery Democrat	1892-1900
William W. Heard	Democrat	1900—

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LOUISIANA. A city in Pike County, Mo., 86 miles northwest of Saint Louis; on the Mississippi River, and on the Chicago, Burlington and Quincy, the Chicago and Alton, and other railroads (Map: Missouri, E 2). It has a public school library of 3000 volumes. The city controls an important trade, particularly in fruit, produce, tobacco, grain, live stock, etc.; and among its industrial plants are nurseries, flour and lumber mills, manufactories of buttons, tobacco, cigars, carriages, and wagons, a stone quarry, lime kiln, brick yards, etc. The nurseries here are very extensive, ranking among the largest in the United States. Population, in 1890, 5090; in 1900, 5131.

LOUISIANA GRASS. See PASPALUM.

LOUISIANA PURCHASE. The purchase by the United States from France in 1803 of the 'Province of Louisiana.' In the spring of 1802 news reached the United States that Spain, by the secret Treaty of San Ildefonso, concluded in October, 1800, had retroceded Louisiana to France, and the uneasiness caused thereby was soon increased by the announcement that the Spanish Intendant had withdrawn the right of deposit secured to the inhabitants of the United States by the treaty of 1795, and that Louisiana was to be delivered to France at an early date. President Jefferson was alarmed at the prospect of danger arising from the proposed transfer to France, and declared that the day she took possession the ancient friendship between the United States and France would be at an end, and the United States must henceforth ally itself with the British nation. The President expressed this belief to Congress in his annual message, and at the same time wrote to the American Minister at Paris, Robert R. Livingston, that if France considered Louisiana indispensable to her interests she might still cede to the United States the island of New Orleans and the Floridas, and thus remove, to some extent, the causes of the irritation. Believing that this end could be best accomplished by sending a man direct from the United States, he selected, in January, 1803, James Monroe to act as minister plenipotentiary with Livingston. The Senate confirmed the nomination, and placed the sum of $2,000,000 at their disposal to accomplish the object of the mission. The war between France and England had just been renewed, and Napoleon, realizing the invincibility of England on the sea, doubted the ability of France to hold Louisiana against such a power. To the astonishment of the commissioners, therefore, Napoleon, through Talleyrand, proposed to sell the entire Province of Louisiana, and asked for an offer. The Marquis de Marbois, Minister of the Treasury, was then selected by Napoleon to conduct the negotiations. In the meantime Monroe arrived (April 12), and the negotiations began in earnest. Marbois insisted on 100,000,000 francs and the assumption of Louisiana's debts by the United States, but finally agreed to take 80,000,000 francs, including 20,000,000 for the debts which the United States was to assume, and on this basis the sale was effected, April 30, 1803. President Jefferson did not think that the Constitution warranted the annexation of Louisiana, and considered that an amendment would be necessary—an "act of indemnity," as he expressed it; but there was such general acquiescence by the people that the matter was dropped, and Jefferson advised Congress that the less said about the constitutional difficulty the better. The treaty was ratified by the Senate on October 20th by a vote of 24 to 7, and was laid before both Houses, that they might provide for its execution. The treaty provided that the inhabitants of Louisiana should be incorporated into the Union and admitted to the full enjoyment of all the rights and immunities of citizens of the United States as soon as possible; that meanwhile they should be protected in the enjoyment of liberty, property, and worship; and that the ships of both France and Spain should for twelve years enjoy special privileges of entry at New Orleans. Accompanying the treaty were two conventions providing for the manner of payment, and for the settlement of the debt. Up to June 20, 1880, the total cost of Louisiana, principal, interest, and debts assumed, was $27,267,621 (McMaster). The area purchased exceeded 1,000,000 square miles. The population did not exceed 90,000, including French, Spanish creoles, Americans, English, and Germans, and about 40,000 slaves. Consult: Hosmer, *The History of the Louisiana Purchase* (New York, 1902); and Howard, *History of the Louisiana Purchase* (Chicago, 1902). See UNITED STATES, EXTENSION OF THE TERRITORY OF THE.

LOUISIANA PURCHASE EXPOSITION. See SAINT LOUIS WORLD'S FAIR.

LOUISIANA STATE UNIVERSITY AND AGRICULTURAL AND MECHANICAL COLLEGE. A State institution of learning, at Baton Rouge, La., chartered in 1877. It was based on the Louisiana State Seminary of Learning and Military Academy, opened in 1860 near Alexandria, and removed to Baton Rouge in 1869. The Agricultural and Mechanical College, opened at New Orleans in 1874, was merged with the university in 1877. In 1886 the United States Government gave the use of the buildings and grounds of the military garrison at Baton Rouge, and in 1902 the full title to the property was vested in the institution. The courses offered are literature, Latin-scientific, general science, commerce, agriculture and sugar-raising, mechanical, and civil engineering. The degrees conferred are B.A., B.S., M.S., C.E., M.E., and M.A. The university has three experiment stations, at New Orleans, Baton Rouge, and Calhoun. The discipline is military. In 1902 the attendance was 420, including 162 sub-freshmen. The library contained about 24,000 volumes. There were 29 instructors. The endowment was $320,000, the income about $50,000, and the grounds, buildings, and equipment were valued at $551,000.

LOUIS NAPOLEON, *Fr. pron.* lōō'ē' nȧ'pô'lā-ôɴ'. See Napoleon III.

LOUIS PHILIPPE, fē'lēp' (1773-1850). King of the French from 1830 to 1848. He was the eldest son of Philippe, Duke of Orleans, and was born in Paris, October 6, 1773. He received at his birth the title of Duke of Valois, and afterwards that of Duke of Chartres. His education was intrusted to the care of the celebrated Mme. de Genlis. On the outbreak of the Revolution he entered the National Guard, and became a member of the Club of Friends of the Constitution, afterwards that of the Jacobins. His father renounced his titles in 1792, and assumed the surname of Egalité, and Louis Philippe followed his example. In the same year, as lieutenant-general, Louis Philippe took part in the battle of Valmy. He distinguished himself at Jemappes (November 6, 1792); but his situation became very dangerous after the battle of Neerwinden (March 18, 1793), in which he suffered defeat with Dumouriez. He was included in the order for arrest issued against Dumouriez, and in April, 1793, escaped with him into Austrian territory. He sought in Switzerland a place of security for his sister, Adelaide, wandered about among the mountains for four months, and accepted a situation as teacher of geography and mathematics in a school at Reichenau, near Chur, assuming the name of Chabaud-Latour. After the execution of his father, November, 1793, he traveled for some time in the north of Europe, was in the United States from 1796 to 1800, and then took up his residence at Twickenham, near London, with his two younger brothers, one of whom died in 1807 and the other in 1808. In 1809 he married Marie Amélie, daughter of Ferdinand I. of the Two Sicilies. In 1808 and again in 1810 he made abortive attempts to play a part in the Spanish War against Napoleon. On the fall of Napoleon he hastened to Paris, where he was received with distrust by Louis XVIII. After the second Restoration he recovered his great estates, which the Imperial Government had sequestrated. Disliked by the Court, he was very popular with the inhabitants of Paris. He kept aloof, however, from political intrigues. When the bloody days of the July Revolution had ended with the overthrow of the government of Charles X., the Chamber of Deputies, at the instance of the banker Laffitte, appointed him Lieutenant-General and Regent of the Kingdom (July 30, 1830). A week later the two Chambers offered him the royal crown, which he formally accepted on August 9, 1830, taking the oath to the reformed Constitution. He defended his conduct toward the elder Bourbons by protesting that he acted for the welfare of France. Louis Philippe sought to strengthen his throne by gaining the support of the *Bourgeoisie*, or middle classes, and repressed all the extreme parties by what became known as the *juste-milieu* policy. The brief Ministry of Laffitte (1830-31) was succeeded by that of Casimir-Périer (1831-32), on whose death Marshal Soult formed a coalition Ministry, with Thiers and Guizot as the leading spirits. Among the events which marked the early years of the reign of Louis Philippe were the abolition of the hereditary peerage (1831); the armed intervention in behalf of Belgium; the insurrections of workingmen in Lyons, Paris, and elsewhere; the attempt of the Duchess of Berry to excite a revolution in behalf of her son, the Duke of Bordeaux (1832); and the appearance of Abd-el-Kader as the leader in the struggle against the French in Algeria. In 1836, and again in 1840, Louis Napoleon made abortive attempts to excite military insurrections in his favor. After various Ministerial changes the Soult-Guizot Cabinet was installed in 1840, Guizot, who held the portfolio of Foreign Affairs, being its virtual head. In 1841 the work of converting Paris into what was expected to be an impregnable fortress was begun. In 1842 the Duke of Orleans, the heir to the crown, met with an accidental death—a loss which was deeply deplored by the nation. The foreign policy of Louis Philippe, which was in general that of peace, aroused great dissatisfaction among the people, who after 1840 were swept away by a revival of Napoleonic sentiment, stimulated by the removal of the great Emperor's bones from Saint Helena and their interment at the Invalides. The conquest of Algeria, accomplished during this reign, could not counterbalance the weakness of the French diplomacy in the East, where France refused to join the Powers in their repression of Mehemet Ali in 1840. The extreme democrats hated the King, and frequent attempts were made on his life, the most notable of which was that of Fieschi in 1835. The country prospered under Louis Philippe's Government; but the scandals which were brought to light in the administration, the shameless corruption in the electoral system, and the selfish course pursued by the King, alienated the affections of the people. (See France.) A demand for reform in the electoral system became loud and general, and was unwisely opposed by the King and the Guizot (q.v.) Ministry; while the conduct of the former in the matter of the marriages of the Queen of Spain and her sister, manifesting a disregard of every consideration but the interests of his own family, excited a strong feeling of indignation throughout Europe. The French nation became much excited; 'reform banquets' began to be held; the Government attempted to prevent them by force; insurrectionary disturbances ensued in the streets of Paris on February 22, 1848; and on the following day the 'Citizen King' saw with alarm that the National Guard could not be expected to support him. The retirement of Guizot failed to pacify the people. On February 24th the King abdicated in favor of his grandson, the Count of Paris; but the Chamber of Deputies refused to acknowledge the boy as King. Louis Philippe, deserted by his courtiers, fled to the coast of Normandy with his Queen, concealed himself for some days, and at length found opportunity of escaping in a British steamboat to Newhaven, under the name of 'Mr. Smith.' The brief remainder of his life was spent in England. He died at Claremont, August 26, 1850. He was a man of ability and accomplishments; but, with all his democratic ideals, he never brought his Government into hearty sympathy with the people. Consult: Hillebrand, *Geschichte Frankreichs* (Gotha, 1877-79), excellent, monarchical, begins 1830, interrupted by the author's death (1848); Thureau-Dangin, *Histoire de la monarchie de juillet* (Paris, 1887-92), very monarchical in tone; Montalivet, *Le roi Louis-Philippe* (ib., 1851). See JULY REVOLUTION.

LOUIS THE GERMAN (c.804-876). King of the Eastern Franks from 843 to 876. He was the third son of the Emperor Louis the Pious, and when his father in 817 made a division of the Empire among his sons, Louis received a kingdom centring around Bavaria. This was the nucleus of the Kingdom of Germany. In the later divisions, between 829 and 840, Louis always retained Bavaria. During these years he was engaged in almost constant struggles against his father or against his brothers. After the death of Louis the Pious, in 840, he joined with Charles the Bald against Lothair. In 841, in the battle of Fontenoy, he and Charles defeated Lothair and forced the latter in 843 to agree to a fresh division of the Empire in the Treaty of Verdun. Louis remained King of the German or East Frankish Kingdom, ruling over Bavarians, Swabians, Franconians, and Saxons. He had to defend his dominions against Slavic invaders on one side and Northmen on another. In 858 he invaded the West Frankish Kingdom and conquered it in part; but in 860 he made peace, resigning his conquests to Charles the Bald. In 870 he forced Charles the Bald to make the Treaty of Mersen, by which the Lotharingian territories were divided between the West Frankish and the German kingdoms. He died at Frankfort, August 28, 876. Consult Dümmler, *Geschichte des ostfränkischen Reiches* (2 vols., 2d ed., Berlin, 1887).

LOUIS (I.) THE GREAT (c.1326-82). King of Hungary from 1342 to 1382. He was the son of Charles Robert, King of Hungary. He was an indefatigable warrior and generally victorious. His long war against Queen Joanna of Naples (see JOANNA I.) was indecisive, although for a time Louis wore the crown of the Kingdom of the Two Sicilies. With Venice he waged three wars and succeeded, in 1357, in expelling the Venetians from all the Dalmatian cities. In 1352 he had brought Moldavia under his power. In 1365 he won a great victory over the Turks. In 1370 he succeeded Casimir as King of Poland, to which the latter had already by conquest united Galicia. He was succeeded in Hungary and Poland by his daughter Mary, who became the wife of Sigismund of Brandenburg, subsequently Holy Roman Emperor. Louis was renowned for his chivalry and the splendor of his Court. He increased the royal power, gave charters to the cities, encouraged commerce and education, and reformed the administration of justice, thus on the one hand improving the welfare of his country, on the other, by his costly wars, menacing all prosperity. Consult Horváth, *Geschichte Ungarns*, vol. i. (2d ed., German trans., Budapest, 1876).

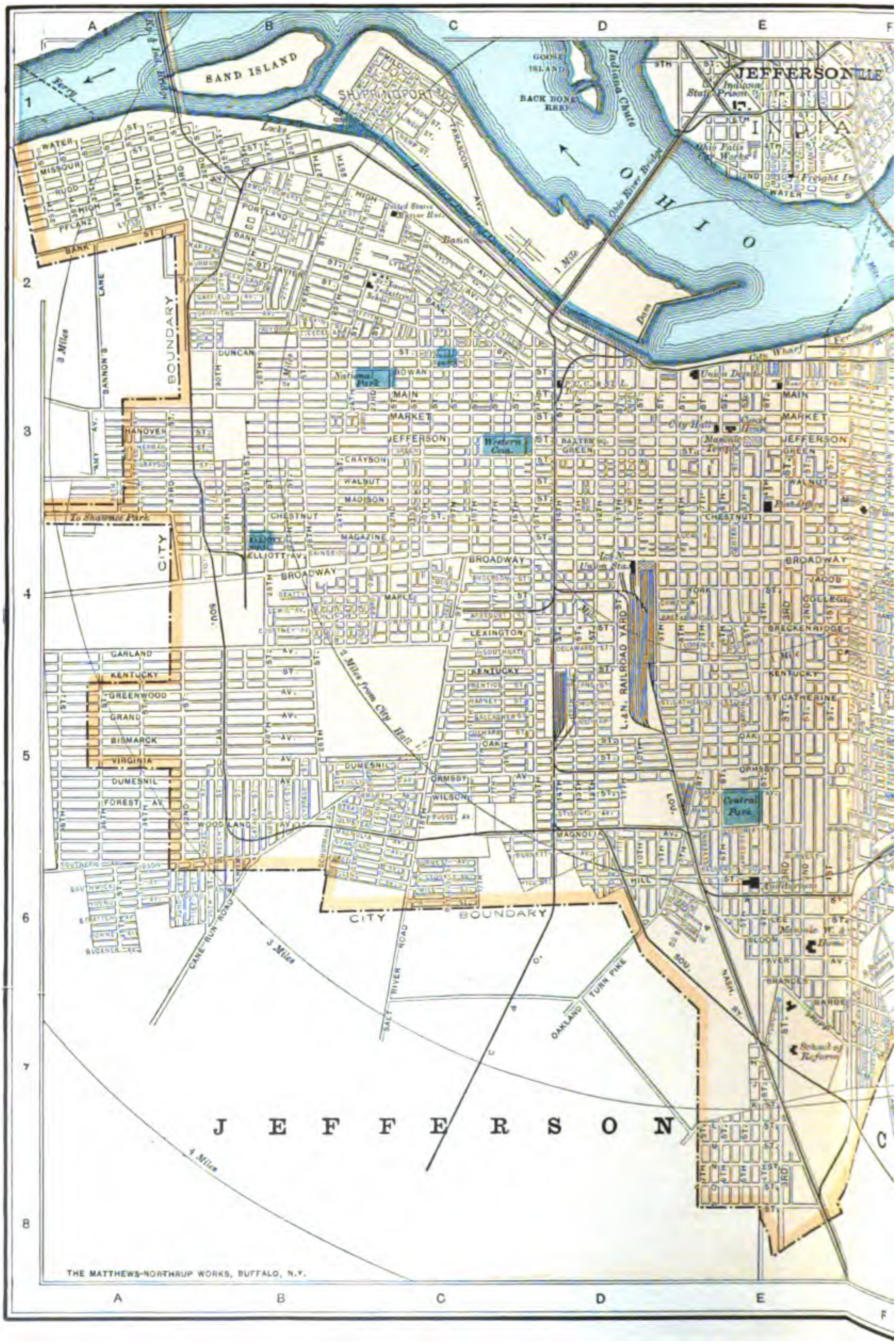
LOUISVILLE, lo͞o'ĭ-vĭl *or* lo͞o'ĭs-vĭl. The largest city of Kentucky, and the county-seat of Jefferson County, on the Ohio River, 130 miles below Cincinnati, and 110 miles distant by rail (Map: Kentucky, F 2). The Ohio at this point makes a descent, by a series of rapids, of 26 feet in 2 miles, the rapids, when impassable in low water, being avoided by a canal around the falls, 2½ miles long. Steamers from the city reach 33 navigable rivers, and railroad facilities, too, are excellent, 10 great systems entering here, among which are the Southern, the Illinois Central, the Louisville and Nashville, the Chesapeake and Ohio, the Pennsylvania, and the Baltimore and Ohio Southwestern. Three steel railroad bridges, two to Jeffersonville, one of which is a mile long, and one to New Albany, connect Louisville with the State of Indiana.

Louisville, the 'Falls City,' 20 square miles in extent, lies 60 feet above low-water mark, and is free from inundations. It is surrounded by a fine agricultural country and is adjacent to a region of immense forests and coal and iron mines. It has a river-front of about eight miles. There are 170 miles of streets, mostly well paved with macadam, brick, asphalt, and granite, and in great part beautifully shaded, broad and regular, varying in width from 60 to 120 feet. The street railway system comprises 175 miles, and extends to all parts of the city.

Among the more prominent structures are the city hall, county court-house, custom-house, Institute for the Blind and the American Printing House for the Blind, Industrial School of Reform, Columbia Building, Masonic Widows' and Orphans' Home, and the hospitals and homes, which number 42 in all. There is one public library of over 50,000 volumes, that of the Polytechnic Society of Kentucky, in connection with which are a museum, an art gallery, and a valuable collection of minerals. Louisville is noted as a centre for medical education. It has nine medical colleges and a dental school, two law colleges, three theological seminaries, two schools of pharmacy, a normal school, manual training school, and many other institutions, both private and included in the efficient public school system. The public parks, five in number and embracing 1079 acres, comprise the more notable Iroquois, Shawnee, and Cherokee parks, as well as smaller preserves and squares in the more populous sections. Cave Hill Cemetery, in the eastern part of the city, has a fine site and is beautifully laid out. Among other objects of interest are the grave of Zachary Taylor, a monument to Confederate soldiers, and statues of Henry Clay and Thomas Jefferson.

With its exceptional transportation facilities, Louisville is naturally the centre of a vast distributing and export trade. It is perhaps the largest tobacco market in the world; is also an important market for live stock, and exports extensively its principal manufactured products, which include whisky, jeans, sole-leather, plows, cement, farm wagons, soap, flour, plumber's supplies (iron, gas and water pipe, porcelain bathtubs, brass fittings, etc.), vinegar, malt liquors, and many other articles. Pork-packing is another very considerable industry.

The government is vested in a mayor, elected every four years; a bicameral council; and administrative departments as follows: board of works, board of safety, comptroller, gas inspector, and city buyer, nominated by the executive with the consent of the council; city attorney and assessor, elected by the council; and public school board, chosen by popular election. Louisville spends annually, in maintenance and operation, nearly $3,000,000, the principal items of expenditure being about $535,000 for schools, $280,000 for the police department, $270,000 for the fire department, $165,000 for street sprinkling and cleaning, including amounts for garbage removal; $150,000 for municipal lighting, $140,000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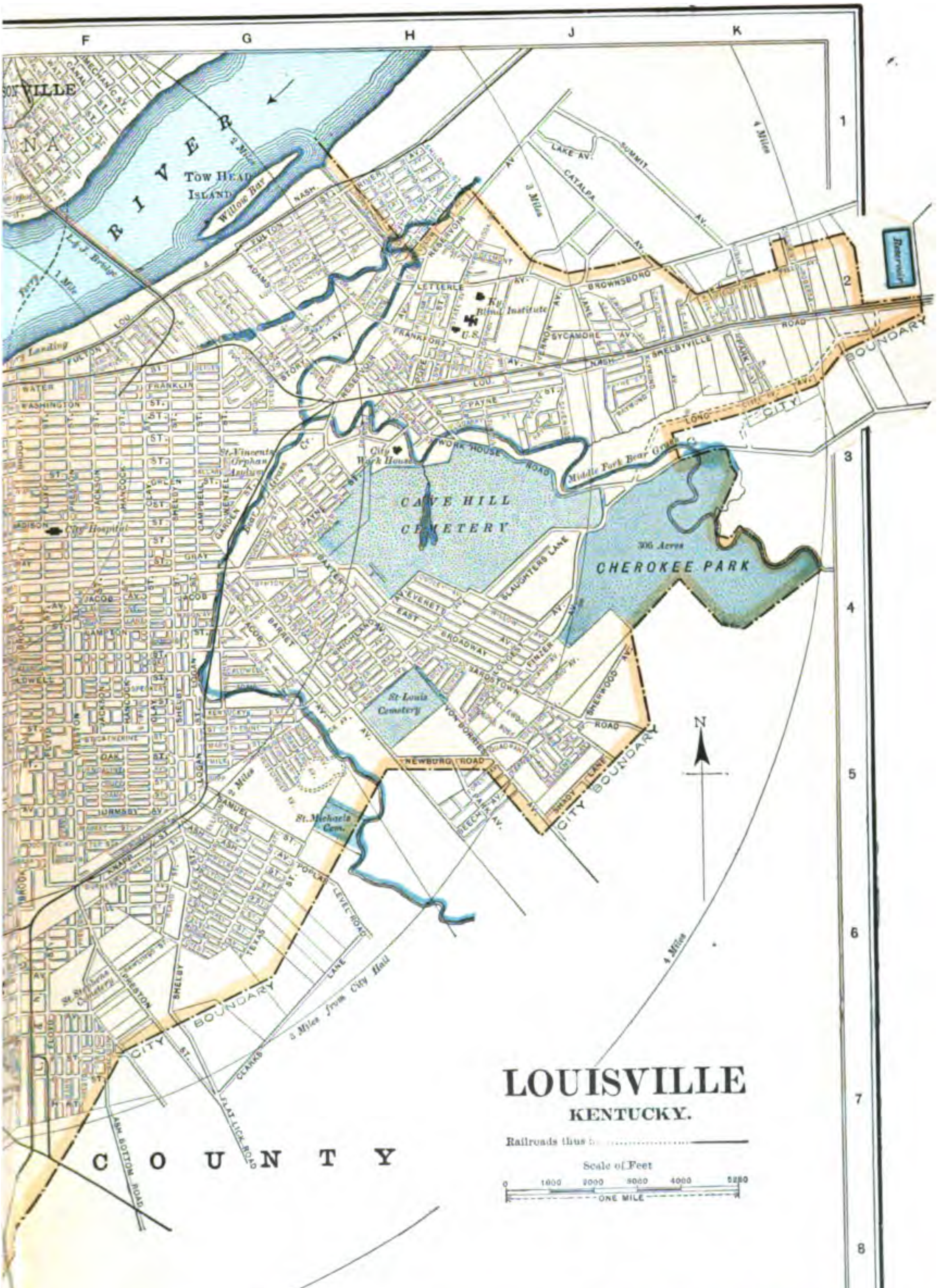
SAND ISLAND
SHIPPINGPORT
GOOSE ISLAND
BACK BONE REEF
Indiana Chute
JEFFERSONVILLE
Indiana State Prison
INDIANA
OHIO
Ohio River Bridge
Ohio Falls Car Works
Freight
Ferry
Locks
Dam
1 Mile
Basin
United States Marine Hosp.
WATER
MISSOURI
RUDD
HIGH
PFLANZ
BANK
PORTLAND
DUNCAN
ROWAN
MAIN
MARKET
JEFFERSON
GREEN
CRAYSON
WALNUT
MADISON
CHESTNUT
MAGAZINE
ELLIOTT AV.
BROADWAY
MAPLE
LEXINGTON
KENTUCKY
DUMESNIL
ORMSBY
WILSON
MAGNOLIA
HILL
National Park
Western Cem.
Elliott Park
Union Depot
City Hall
Court House
Masonic Temple
L. & N. Union Sta.
L. & N. RAILROAD YARD
Central Park
JACOB
COLLEGE
BRECKENRIDGE
ST. CATHERINE
OAK
Auditorium
Masonic W. & O. Home
School of Reform
HANOVER
GARLAND
KENTUCKY
GREENWOOD
GRAND
BISMARCK
VIRGINIA
DUMESNIL
FOREST AV.
WOODLAND
To Shawnee Park
CITY BOUNDARY
CITY BOUNDARY
BANNON'S LANE
3 Miles
2 Miles from City Hall
3 Miles
4 Miles
CANE RUN ROAD
SALT RIVER ROAD
OAKLAND TURN PIKE
SOU.
L. & N. R.R.
JEFFERSON
THE MATTHEWS-NORTHRUP WORKS, BUFFALO, N.Y.



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for the water-works, and $100,000 for police courts, jails, reformatories, etc. The city owns and operates the water-works; the plant, built at a cost of nearly $6,000,000, was acquired in 1860, and the whole system now comprises over 230 miles of mains. The sewerage system has over 105 miles of mains, and there are 26 miles of mains for natural gas, which is used to a considerable extent for domestic purposes. The total property valuation is placed at $130,000,000.

Population, in 1800, 359; in 1850, 43,194; in 1860, 68,033; in 1870, 100,753; in 1880, 123,758; in 1890, 161,129; in 1900, 204,731, including 21,400 persons of foreign birth, and 39,100 of negro descent.

In 1778 thirteen families came down the river with Col. George Rogers Clarke, and settled on a small island—since eaten away by the river—near the head of the Ohio Falls. In the following year they moved to the mainland and laid the foundations of the present city. In 1780 the settlement, with a population of about 60, was incorporated as a town by the Virginia Legislature, and named Louisville in honor of Louis XVI. of France. In 1824 it was chartered as a city by the Kentucky Legislature. On August 6, 1855 ('Bloody Monday'), a mob, said to have been incited by the 'Know-Nothings,' destroyed much property and a number of lives. During the Civil War the city was Unionist in sympathy. In September, 1862, the Confederates under General Bragg threatened an attack, but withdrew on the arrival of General Buell's army. In March, 1890, a tornado that swept through the city caused the death of 100 persons and destroyed property worth $3,000,000. Consult: Johnston, *Memorial History of Louisville* (Chicago, 1896); and Powell, *Historic Towns of the Southern States* (New York, 1900).

LOUIS WILLIAM I., Margrave of Baden-Baden (1655-1707). He was the son of Ferdinand Maximilian, heir to the throne of Baden. He was born in Paris, brought up in Baden, and served under Montecuculi against the French. After the Treaty of Nimeguen (1678), he fought against the Turks, in 1683 at Vienna, in 1689 at Nissa, in 1690 in Transylvania, in 1691 at Slankamen. In 1693 he was on the Rhine, captured Heidelberg, and fought in Alsace. During the War of the Spanish Succession he served under Marlborough, and became field-marshal in 1704. He was an excellent military engineer.

LOULÉ, lō-lā′. A town in the extreme southern part of Portugal, in the Province of Algarve, picturesquely situated seven miles northwest of Faro (Map: Portugal, A 4). It is an old town with remains of Moorish walls and towers, and several notable churches, one of which is a place of pilgrimage. The principal industry is the manufacture of wickerwork, and there are silver and copper mines in the neighborhood. Population, in 1878, 14,448; in 1900, 22,511.

LOUNS′BURY, Thomas Raynesford (1838—). An American literary historian and critic, born in Ovid, N. Y., January 1, 1838. Lounsbury graduated at Yale in 1859, and has since received honorary degrees from Yale, Harvard, Lafayette, and Princeton. He was engaged editorially on the *New American Cyclopædia* from 1860 to 1862, and enlisted then in the 126th New York Volunteers, in which he served to the close of the Civil War. He then taught in New York and studied Early English. In 1870 he became instructor in English in Yale College, and in 1871 professor of English literature in the Sheffield Scientific School of Yale University, of which school he was also librarian. He continued to investigate the older periods of English, and in this field edited Chaucer's *House of Fame* and *Parlement of Foules*, and wrote his most important work, *Studies in Chaucer* (3 vols., 1891), a monument of scholarly industry, but equally remarkable for literary appreciation and critical acumen. He published in 1879 a *History of the English Language*, and a life of *James Fenimore Cooper* in the "American Men of Letters Series" (1883). This is regarded as one of the best of brief biographies. His latest work is a history of Shakespearean criticism entitled *Shakespearean Views*, of which two volumes, *Shakespeare as a Dramatic Artist* and *Shakespeare and Voltaire*, have appeared.

LOUPS. The French name for the Delawares and certain other Indian tribes. See Mahican.

LOURDES, lo͞ord. One of the chief places of Catholic pilgrimage in Europe, in the Department of Hautes-Pyrénées, France, on the right bank of the Gave de Pau, 90 miles by rail east-southeast of Bayonne (Map: France, F 8). It is a small town commanded by an old fortress now used as a prison. There are many grottoes and marble-quarries in the vicinity. The fame of Lourdes dates from the reputed apparition of the Virgin to the fourteen-year-old Bernadette Soubirous in 1858. The grotto near which the apparition took place is now surmounted by a magnificent church built in accordance with the wish of the Virgin and containing numerous banners, shields, medallions, tablets, and other precious gifts from pilgrims who visit Lourdes. These number about 300,000 per annum. Near the grotto is the miraculous spring, the water of which is diverted into several basins in which the ailing pilgrims bathe. The water is also exported in bottles. Economically the town is entirely dependent on the pilgrims, and its chief products are various souvenirs, mostly of a religious character, and marble. Population, in 1901, 8708. Consult: *Les annales de Notre-Dame de Lourdes;* Fourcade, *L'apparition de Lourdes considérée au point de vue de l'art chrétien* (Bordeaux, 1862); *Pèlerinage national de Notre Dame de Salut* (Paris, 1895); Boissarie, *Lourdes, Histoire médicale* (Paris, 1891); Zola, *Lourdes* (Paris, 1894); Gué, *Histoire de Notre Dame de Lourdes* (Paris, 1896).

LOURDES. A novel by Zola, based on the professed miracles performed at Lourdes. The work is interesting for its vivid descriptions of the pilgrimages and processions of devotees. Its attitude provoked the displeasure of the Church authorities.

LOURE, lo͞or. An ancient French dance in $\frac{3}{4}$ or $\frac{6}{4}$ time and slow tempo. It was named after an old French instrument resembling a bagpipe.

LOURENÇO MARQUES, lō-rāɴ′sō mär′kĕsh. The southern province of Portuguese East Africa (q.v.).

LOUSE (AS., OHG. *lūs*, Ger. *Laus*, louse; perhaps connected with AS. *lēas*, OHG. *lōs*, Goth. *laus*, empty, vain, AS. *for-lēosan*, Goth. *fra-liusan*, OHG. *for-liosan*, Ger. *ver-lieren*, to lose, Lat. *luere*, Gk. λύειν, *lyein*, to loose, destroy). A parasitic bug of the suborder Anoplura or Parasita, which contains the single family Pediculidæ, dwelling on man and other animals. Lice are grayish-white, more or less transparent, compressed, wingless insects, with fleshy blood-sucking beaks. It is still not certain just how the blood is sucked up. Schiödte placed a louse on his hand and observed it under a lens while feeding. He noted alternate contractions and expansions of parts of the alimentary tract, while the entire tract underwent peristaltic movements and vibrations from side to side. The number of known lice is not large—about six genera and forty species are recorded. Different kinds of mammals are infested with different kinds of lice, even those mammals that live in water. Seals have a genus, Echinophthirius. Several species of the genus Pedicinus infest monkeys. Elephants have a louse (*Hæmatomyzus proboscideus*) with a remarkably long proboscis. The louse of the horse (*Hæmatopinus asini*), that of the pig (*Hæmatopinus urius*), and that of the cow (*Hæmatopinus eurysternus*) are the best known of those that dwell on domestic animals. Three species belong to man: one (*Pediculus capitis*) is found on the head; another (*Pediculus vestimenti*) on the body, breeding in soiled clothing; and a third (*Phthirius inguinalis*) lives in the eyebrows, armpits, and the pubic region. Andrew Murray stated that the heads of different races of men are infested with different varieties of *Pediculus capitis*, basing his conclusions upon the collections made by Darwin.

Little is known concerning the development of lice. The eggs are fastened to the hair, and the young, although they molt several times, do not undergo metamorphosis. There is a disease called phthiriasis attributed to lice, but for aught that is really known the lice may be merely an accompaniment of the neglected and unclean condition which, perhaps, is really the cause of the disease. Mercurial ointment is generally recommended for use against the species affecting human beings. Cleanliness is the best preventive of lice on man and beast. To destroy them on domestic animals washing with infusions of soapsuds, tobacco, and kerosene is recommended. Various ointments composed of lard or tallow, in which sulphur or zinc is mixed, are sometimes used. Wood ashes and Persian insect-powder sprinkled plentifully in the hair or wool are also said to be efficacious. Such washings and applications should be repeated several times at intervals, and barns which contain infested animals should be thoroughly whitewashed.

The word is also used in combinations such as 'bird-louse,' 'plant-louse.' The plant-lice are Hemiptera, but belong to a different family, the Aphididæ (see APHID); while the bird-lice belong to the Mallophaga (q.v.)—a distinct order of insects parasitic on birds. Consult Osborn, *Insects Affecting Domestic Animals* (Department of Agriculture, Washington, 1896).

LOUSE-FLY. Any one of the curious degraded parasitic flies of the family Hippoboscidæ. In the adult stage they live, like lice, parasitically upon the bodies of birds and mammals. Some species are winged, others are wingless, and others are winged for a time and then lose their wings. They form the curious group known as Pupipara, the eggs having hatched and the larva developed until the pupa stage is nearly reached within the body of the mother. They are extruded by the parent fly only when nearly ready to become pupæ. The proboscis of the adult consists of two hard flaps which spread apart, allowing the sucking-tube to be thrust out from the head. The so-called sheep-tick (*Melophagus ovinus*) is a member of this group. The insect known in England as the forest-fly (*Hippobosca equina*) is a winged species which occurs upon the horse. One of the commonest North American species is *Olfersia Americana*, found upon the horned owl, certain hawks, and the ruffed grouse or partridge. The members of this family have been called 'bird-ticks,' but this name is very misleading, since they are not confined to birds, and they have no relation whatever to the true ticks. See FOREST-FLY and TICK.

LOUSEWORT. A popular name for a genus of plants. See PEDICULARIS.

LOUSIAD, THE. A mock heroic poem (1785) in five parts by John Wolcott (Peter Pindar), suggested by the presence of an insect on a plate of peas set before George III. The occurrence is said to have resulted in the compulsory shaving of the heads of the kitchen servants.

LOUTH, louth. A maritime county of the Province of Leinster, Ireland, bounded north by Armagh and the Lough of Carlingford, east by the Irish Sea, south by the Boyne and the county of Meath, and west by Meath and Monaghan (Map: Ireland, E 3). Area, 316 square miles. Wheat, barley, oats, and green crops are extensively grown. Linen is largely manufactured. Capital, Drogheda. Population, in 1841, 128,350; in 1901, 65,740.

LOUTH. A market-town and municipal borough in Lincolnshire, England, 25 miles east-northeast of Lincoln, on the Lud (Map: England, G 3). The town has iron-foundries, a variety of manufactures, and an important trade in agricultural produce. By means of the Loughborough Canal, connecting the town with the Humber, considerable traffic in corn and coal is carried on. Among its interesting features are the beautiful parish church built in the thirteenth and rebuilt in the fifteenth century, a grammar school founded in the reign of Edward VI., and the ruins of Louth Park Abbey, dating from the twelfth century. The town is provided with gas and water, and owns markets, a cemetery, and a technical school. It received its charter from Edward VI. Population, in 1891, 10,040; in 1901, 9500.

LOUTH. A Church of England divine. See LOWTH, ROBERT.

LOUTHERBOURG, lo͞o'tar'bo͝or', PHILIPPE JACQUES DE (1740-1812). A French-English landscape, marine, and battle painter. He was born at Strassburg, October 31, 1740. He received his first instruction from his father, who was a miniature painter. In 1755 he went to Paris, and became a pupil of Casanova, a battle-painter. He gained some repute as a popular painter of battles, hunts, marine views, and landscapes, and was also successful in biblical subjects and portraits. In 1767 he was made member of the Academy of Painting in Paris and afterwards appointed Court painter to the King. He settled in England (1771), and in 1781 was made member of the Royal Academy. He died at Chiswick, March 11, 1812. His landscapes and marine subjects are characterized by romantic feeling. His large battle scenes, "Lord Howe's Victory on June 1, 1794," "Admiral Duncan's Victory at Camperdown, 1797," "Landing of British Troops in Egypt," and the "Siege of Valenciennes," were much admired by his contemporaries. His other works include the "Burning of London in 1666" (1797), "Destruction of Spanish Armada," "Storm at Sea" (1767), and "Landscape After Storm" (1765). He designed many plates and vignettes for Macklin's *Bible*, Bowyer's *History of England*, and similar works. Consult Dussieux, *Les artistes français à l'étranger*. (Paris, 1876).

LOUVAIN, lo͞o'văɴ' (Flem. *Leuven*, Ger. *Löwen*). A famous town in the Province of Brabant, Belgium, situated on the Dyle, 18 miles by rail east of Brussels (Map: Belgium, C 4). The old ramparts of the town, over 7 miles in circumference, have been converted into promenades. Architecturally, Louvain is of considerable importance, and its town hall is regarded as among the finest on the Continent. It is a late Gothic building erected by Matthew de Layens in 1447-63, with three façades profusely adorned with statuary and reliefs and six octagonal turrets terminating in spires. The archives here are valuable. The Church of Saint Pierre (1425-97) is a well-proportioned cruciform building, and contains noteworthy pictures by Dierick Bouts. The Flamboyant fifteenth-century Church of Saint Gertrude is noted for its carved choir-stalls, dating from the sixteenth century. The churches of Saint Michel and Saint Jacques also contain some interesting paintings, and the modern Church of Saint Joseph has some good frescoes. The principal modern buildings are the theatre and the post-office. The famous University of Louvain (q.v.) occupies the former warehouse of the clothmakers' guild. Besides the university, Louvain has an athenæum, two seminaries for teachers, and an industrial and an art school. In the fourteenth century Louvain was one of the principal centres of clothmaking in Europe, about 15,000 people having been engaged in that industry. After several insurrections in the second half of the fourteenth century the town was taken by Duke Wenceslas of Brabant in 1382, and his severe treatment of the citizens compelled thousands to emigrate to Holland and England. The textile industry of Louvain is now practically extinct. At present the chief products of the town are beer and spirits, tobacco, lace, and starch. Population, 1891, 40,624; 1901, 42,308. In 891 the Normans were defeated by Arnulf at Louvain, and in 986 the town became the residence of its own counts, who subsequently became the dukes of Brabant. In the sixteenth century the plague carried off about half of the population of the town.

LOUVAIN, University of. A Belgian university which was founded in 1425-26 by John IV., Duke of Brabant, and richly endowed by the citizens. It had some twenty-eight colleges, the most famous of which was the Collegium Trilingue, founded in 1517 for the study of Greek, Latin, and Hebrew, by Hieronymus Buslidius. This made it for a time the greatest stronghold of the New Learning in Europe. In the later sixteenth century it became one of the most powerful agencies in the Counter Reformation. In 1788 three of its faculties were moved to Brussels. It was suppressed during the wars of the French Revolution, restored after the expulsion of the French from Belgium, and again suppressed when Belgium revolted from Holland. The new University of Louvain grew out of a foundation at Mechlin by the Belgian Church (Catholic) of a university in 1834, moved the next year to Louvain, and was supported by the Church under control of the bishops. This has no connection with the old foundation. It had in 1901 nearly 1900 students, in the usual four faculties. Consult Reusens, *Documents relatifs à l'histoire de l'Université de Louvain*, vols. iii.-v. (Louvain, 1886-90).

LOUVET DE COUVRAY, lo͞o'vâ' de ko͞o'vrâ', Jean Baptiste (1760-97). A French politician and man of letters. He was born in Paris, and in 1787 acquired notoriety by the publication of a licentious romance, *Les amours du Chevalier Faublas*. Embracing the cause of the Revolution, he became a journalist and pamphleteer, and defended the excesses of the new régime against the supporters of the old. In the Jacobin Club, where he was a prominent speaker, he attacked Robespierre, and on being expelled, joined the Girondists in the Convention. On October 29, 1792, he delivered his famous philippic against Robespierre's aspirations toward the dictatorship. Involved in the fall of the Girondists, he escaped capture by flight. He returned to the Convention in 1795, and became a member of the Five Hundred in the following year. Louvet undoubtedly was a man of high principles, apt to be carried away by enthusiasm, sincere, and patriotic. He wrote a novel, *Emilie de Vermont* (1791), dealing with the question of divorce, and *Mémoires sur la révolution française* (edited by Aulard, 1889).

LOUVIERS, lo͞o'vyâ'. A town in the Department of Eure, France, situated on the Eure, 26 miles by rail south-southeast of Rouen (Map: France, G 2). Its thirteenth-century Gothic Church of Notre Dame has a number of fine tombs, statues, and windows, and a magnificent portal of the fifteenth century. Louviers has long been noted for its cloth manufactures; it also produces machinery and leather. Population, in 1891, 9979; in 1901, 10,219.

LOUVOIS, lo͞o'vwä', François Michel le Tellier, Marquis de (1641-91). Minister of War under Louis XIV. He was born in Paris, January 18, 1641. His father was Chancellor and Secretary of State in the War Department, and purchased for him the reversion of this office. Louvois entered the public service in 1662. He displayed great administrative ability; the organization of the French Army and War Office under him was the most progressive and efficient of any in Europe; but he was always willing to involve Europe in the horrors of war, that he himself might be indispensable to the King. His war policy was ruthless. After the death of Colbert (1683) he became the chief adviser of the King, whose favor he partially lost by counseling him against the marriage with Mme. de Maintenon. He instigated the persecution of the Huguenots, and involved France in the long war of the League of Augsburg. He was responsible under the King for the merciless devastation of the Palatinate in 1689. The relations between Louis XIV. and Louvois were strained by the ill success of the first year of the war, and the Minister's influence was fast disappearing when he died suddenly, July 16, 1691. Consult: Rousset, *Histoire de Louvois et de son administration politique et militaire* (Paris, 1863-65); Michel, *Louvois et les protestants* (ib., 1870); James, *Lives of Cardinal de Retz, Jean Baptiste Colbert, John de Witt, and the Marquis of Louvois* (Philadelphia, 1837), popular, but not recommended for historic accuracy. See France; Louis XIV.

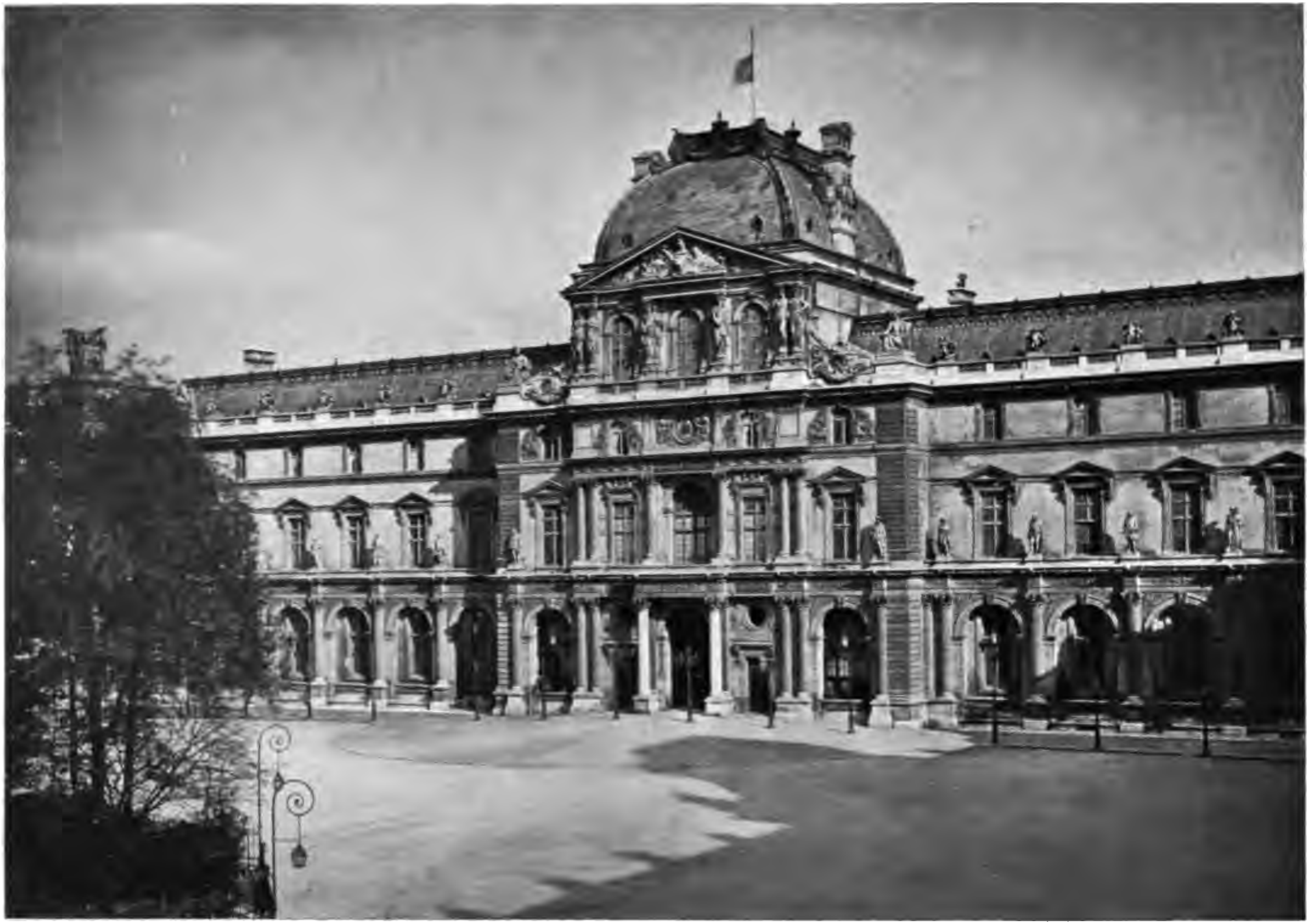
LOUVRE, lo͞o'vr', Palace of the. An extensive group of buildings in Paris, including and connected with a quadrangular square on the north bank of the Seine, in the centre of the city. The site is supposed to have been originally a hunting-site, and was later a castle. The main keep was built in 1204, and many towers were added by Charles V. The Louvre was used as a fortress, arsenal, and prison, and only occasionally as a royal residence. The feudal building remained unchanged until Francis I. took down the keep in 1527. In 1541 he decided on its entire reconstruction, according to a plan submitted by Pierre Lescot (q.v.), in the new Renaissance style. This plan called for four façades around a square, with four corner pavilions. The west front was begun by Pierre Lescot in 1546; he finished the southwest pavilion in 1556, and half of the south side in 1564. Under him worked Jean Goujon (q.v.), the greatest decorative sculptor of the French Renaissance, whose sculptures for the windows, doors, and interior details are famous. What remains of this inner west front is the most perfect example of the French form of rich middle Renaissance. The Louvre, as it now stands, is about four times the size of Lescot's intended building. The large and small galleries were commenced in 1554 under Henry II., after Lesçot's designs, but not completed until the close of the century under the architects Métezan, Du Cerceau, and others. The long gallery west of the original quadrangle, with its main façade on the Seine, was completed in 1608, and is still one of the most impressive of French Renaissance structures. It connected the Louvre with the Tuileries, then in course of erection.

The new plans adopted by Richelieu for the quadrangle of the Louvre itself were by Lemercier, and their centre was the Pavillon Sully, which was begun in 1624. The west side was then finished and the north side begun. Under Louis XIV. the west and inner east sides were first completed by Levau; and then, by order of Colbert, architects were requested to send in designs for a monumental outer façade for the east side, the most beautiful of which proved to be that of an amateur architect, the physician Claude Perrault; it was adopted and carried out between 1665 and 1670. This façade, with its twenty-eight pairs of large Corinthian columns, known as the Colonnade of the Louvre, is one of the purest of Neo-classic monuments, superb and impressive in its grandiose proportions. Unfortunately, its height required the adding of upper stories to other parts of the palace, which not only detracted from their effect, but led to their unroofing and temporary dilapidation owing to the neglect of Louis XIV., who concentrated all his extravagance on Versailles (q.v.).

It was not until the time of the wars of the French Revolution, when Napoleon's victories in Italy gave him the opportunity to bring back such a multitude of artistic treasures to France, that the idea of turning the Louvre into the great national gallery and museum led to its restoration and completion on a grand scale. After the preliminary clearing away, Napoleon I. intrusted to Percier and Fontaine the task of building on the Rue de Rivoli a north connecting gallery between the Louvre and the Tuileries, to correspond to the old long gallery, and this scheme was completed by Napoleon III.—thus completing the New Louvre around the Place du Carrousel. The scheme was due to the well-known Italian Visconti (q.v.), and is one of the most splendid architectural undertakings of modern times; it was completed in 1859, at a cost of about $15,-000,000. The area covered and inclosed by the Louvre and Tuileries, thus combined, was about fifty acres. The entire scheme of composition was, however, ruined by the fire which destroyed the Tuileries in 1871.

The collections contained in the galleries of the Louvre are probably the most valuable in any one building in the world. The treasures of the Cabinet du Roi were increased by Colbert under Louis XIV. by the addition of the Mazarin and Jabach collections, bringing the paintings from about 200 to nearly 850, with 6000 drawings. An inventory of 1710 enumerated 2403 paintings. These auspicious beginnings were interrupted by the removal of the collections to Versailles and the Luxembourg. It was not until 1793 that the Musée National was opened at the Louvre, largely from the various royal collections. A second check occurred in 1815 after the fall of Napoleon, when about 2000 pictures were removed by the Allies. From that time until the accession of Napoleon III. not many additions were made to the pictures, but other departments were organized, such as that of sculptures, based on the Musée d'Angoulême (1824), and the Musée des Monuments Français, first founded by Lenoir; that of ceramics, beginning with the Tochon collection of 574 vases in 1818, and the Durand collection of about 2200 vases in 1825. The Egyptian collections were started with the results of the work of Champollion and enriched by those of Mariette.

The golden age for the collections was inaugurated early in the reign of Napoleon III. by the results of the discoveries of Botta in Assyria, supplemented later by Place, and extended to other parts of Western Asia by Renan and others. The purchase of the immense Campana collection in 1862-63 added greatly to the departments of antique sculpture, jewelry, bronzes, glass, ceramics (c.2000 vases), and even to the paintings. The splendid policy of sending out Government missions to explore and excavate (*Missions scientifiques et littéraires*), either directly or through the French archæological institutes of Athens, Cairo, and Rome (École française d'Athènes, etc.), crowded the museums with antiquities fresh from the soil, sometimes in great series. Last in date to receive attention were the arts of the Middle Ages and the Renaissance, especially the minor and industrial arts, but they are now richly represented. The custom of bequeathing collections to the Louvre has steadily grown in France, since the Lacaze legacy of 275 pictures in 1869, and the accessions under the Third Republic have been quite as much due to private



THE LOUVRE, PAVILLON SULLY

generosity as to the use of public funds and the results of archæological excavations.

There are now seven departments: (1) Egyptian antiquities; (2) Oriental antiquities and ceramics; (3) Greek and Roman antiquities; (4) paintings, drawings, and prints; (5) sculptures of the Middles Ages, Renaissance, and modern times; (6) works of art of the Middle Ages, Renaissance, and modern times; (7) marine and ethnographic collections. These departments are each in charge of a conservateur and assistant. The catalogues and other illustrative works issued are scholarly, and the large group of eminent scholars in charge have made possible the establishment of the famous Ecole du Louvre in 1882, with advanced courses intended to develop specialists in archæology and art. The full course of instruction covers three years of study, and the Louvre has thus become in every way the centre in France for the study of past forms of art. Consult Babeau, *Le Louvre et son histoire* (Paris, 1895).

LOVAGE, lŭv'āj (OF. *luvesche, levesche*, Fr. *livèche*, from Lat. *ligusticum*, lovage, from *Ligusticus*, Ligurian, from *Liguria*, Liguria, from *Ligus, Ligur*, a Ligurian; influenced by popular etymology with *love*), *Levisticum*. A genus of plants of the natural order Umbelliferæ. Common lovage (*Levisticum officinale*) is a native of the south of Europe, with ternate decompound leaves, and obovate wedge-shaped leaflets. It is sometimes cultivated in gardens, and, notwithstanding its strong and peculiar odor, is used as a salad-plant. Its aromatic, acrid, and stimulant roots and seeds are used in confectionery and medicine.

LOVAT, lŭv'at, SIMON FRASER, twelfth Lord (c.1667-1747). A Scottish chieftain and Jacobite intriguer. He was the second son of Thomas Fraser, fourth son of Hugh, ninth Lord of Lovat. His mother was Sybilla, daughter of the chief of the Macleods. He was educated at King's College, Aberdeen, graduated M.A. in 1683, and always bore the reputation of a scholarly man. The Frasers, of Norman origin, possessed extensive territories in the county of Inverness. Simon had influence with the clan, and, although not the direct heir, acquired these lands by intrigue. He also abducted and compelled the widow of the late lord to marry him—a course which involved him in constant turmoil. On the accession of Queen Anne, when his opponents became all-powerful, he fled to the Continent. He was at the bottom of the hoax called the 'Queensberry Plot' in 1703, in which he professed to reveal the policy of the exiled Court and a plan for a rising in its favor among the Highlanders. He had been outlawed, but he was still the darling of his clan, and in 1713 they sent an ambassador to bring him over. The holder of his estates having joined the insurrection of 1715, Simon found it his interest to take the Government side. His clan at once left the insurgents; and for this good service he was invested with the estates, not only by the votes of his clan, but by the law. His life for the ensuing thirty years was active with local intrigues calculated to strengthen his influence. In the insurrection of 1745 he tried to play a double game, sending forth his clan, under the command of his son, to fight for the Pretender, and deeply plotting for that cause, while he professed to be a loyal subject. He thus became a special object of the vengeance of the Government, and after various vicissitudes was captured, taken to London, tried and beheaded. Consult Burton, *Life of Simon, Lord Lovat* (London, 1847).

LOVE À LA MODE. A comedy by C. Macklin (1759). An heiress, Charlotte Goodchild, is freed from the attentions of three fortune-hunting suitors by the feigned loss of her money, and marries her disinterested lover, Sir Callaghan O'Brallaghan.

LOVE-BIRD. The popular name for many diminutive parrots of various genera and even of different families, natives of the warm parts of America, of Africa, the East Indies, and Australia. They receive their name from the affection which they manifest toward one another, whether in a wild state or in a cage. African species (*Agapornis roseicollis* or *Agapornis pullaria*) about the size of a sparrow are now common as cage-birds in Europe and America. They are lively birds, and fond of being caressed. They feed on the seeds, etc., on which canaries are fed, and are fond of chickweed and other plants, with seeds ripe or nearly so. The South American love-birds are all members of the genus Psittacula, of which seven or eight species are known. The African species are of the genus Agapornis, and the Australian and East India love-birds are grouped in several genera. Of these last, one species (*Nasiterina pygmæa*) is noted as the smallest of the parrots. See Colored Plate of PARROTS.

LOVE-FEAST. A religious service observed by certain bodies in imitation of the agapæ of the early Christians. (See AGAPÆ.) It is celebrated by Moravians generally in connection with a solemn festival, or preparatory to the communion. Hymns are sung, a simple meal is served, and in some churches the minister makes an address at the close. Wesley introduced the observance among the Methodists, appointing one evening in each quarter for the men, another for the women, and a third for both together. In the Methodist Episcopal Church the feast is celebrated at the quarterly conference, under the charge of the presiding elder, or, in his absence, of the pastor of the church. The Scriptures are read, with singing and prayer, religious experiences are related, and reports are heard upon Church matters; the Lord's Supper is also often observed at the same time. Love-feasts after the primitive order are held in some of the Baptist missionary churches, and every Sunday by the Sandemanians.

LOVE'JOY, ELIJAH PARISH (1802-37). An American abolitionist, born at Albion, Maine. He graduated at Waterville College in 1826, and at the Princeton Theological Seminary in 1833. Soon after being ordained, he became editor of the *Saint Louis Observer*, an influential Presbyterian paper. At first he refrained from taking any part in the anti-slavery agitation, but as time went on he began to insert occasional paragraphs in his paper which evinced a moderate opposition to slavery, and finally, aroused by the burning of a negro murderer, he wrote an editorial that excited the wrath of the pro-slavery element. Menaced, he removed his press to Alton, Ill., where it was seized by a mob and thrown into the river. Citizens of Alton presented him with another press, and on September 8, 1836, he began the publication of the *Alton Observer.* During the following year he became an outspoken abolitionist, and advocated the formation of a State anti-slavery society in Illinois. The direct result was a visit, in August, 1837, from another pro-slavery mob, which wrecked the *Observer* office and destroyed the press. A third press was bought, only to be at once destroyed upon its arrival. A fourth was then procured and placed in a warehouse under guard of twenty or more armed citizens. At about midnight on November 7, 1837, the place was attacked by thirty or forty men, who, after being warned, were fired upon, and one man was killed. Undismayed by this fatality, one of the assailants attempted to set the warehouse on fire, whereupon Lovejoy stepped out of the building to shoot him, but was himself shot and mortally wounded. The garrison then surrendered, and the press was destroyed. This event caused great excitement throughout the country. Henry Tanner, one of the defenders of the warehouse, wrote *The Martyrdom of Lovejoy* (Chicago, 1881). Consult also: J. C. and Owen Lovejoy's *Memoir* (New York, 1838); Garrison, *William Lloyd Garrison* (New York, 1885); and a chapter, "The Alton Tragedy," in May's *Some Recollections of Our Anti-Slavery Conflict* (Boston, 1869).

LOVEJOY, Owen (1811-64). An American abolitionist, brother of Elijah P. Lovejoy (q.v.). He was born at Albion, Maine; was educated at Bowdoin College, and removed to Alton, Ill., where he witnessed the death of his brother. A man of powerful physique, intense feeling, and great magnetism, he preached and lectured against slavery with a passionate energy that carried the people with him. In 1838 he became pastor of a Congregational church in Princeton, Ill., where he distinguished himself by the boldness of his attacks upon slavery from the pulpit, and his open defiance of the laws prohibiting anti-slavery meetings. In 1834 he resigned his pastorate to accept a seat in the Legislature. From 1856 until his death he was a member of Congress, where he took an active part in the parliamentary conflicts that preceded the Civil War.

LOVEL. (1) In Charles Lamb's *Old Benchers of the Inner Temple,* a character representing the author's father. (2) In Scott's novel *The Antiquary,* a young man, also known as Major Neville, later discovered to be the son of Lord Glenallan.

LOVELACE. In Richardson's *Clarissa Harlowe,* a finished libertine, based upon Lothario in Rowe's *Fair Penitent.*

LOVELACE, lŭv'lās, Francis (c.1618-c.1675). A Colonial Governor of New York. He was the second son of the first Baron Lovelace, and was born in the Parish of Hurley, Berkshire. He adhered to the royal cause during the Puritan Revolution and the period of the Commonwealth, and in 1668 was rewarded with the appointment of Governor of New York to succeed Richard Nicholls. Lovelace allowed religious freedom and encouraged trade and the fisheries, but he refused, all demands for representative government, levied heavy taxes, and caused protests made against them by some of the Long Island towns to be burned by the hangman. When, in 1673, a Dutch fleet appeared in the bay, the majority of the inhabitants received it with joy; and before Lovelace, who was absent from the town, could return, the place surrendered. He was allowed to return to England, and is thought to have died a year or two thereafter.

LOVELACE, Richard (1618-58). A Cavalier poet, born at Woolwich, Kent, in 1618; educated at the Charterhouse School and at Gloucester Hall, Oxford, where he was "accounted the most amiable and beautiful person that ever eye beheld." He took an active part in the Revolution, and was twice imprisoned (1642 and 1648). After the execution of the King he was released. He began writing verse while at Oxford. A comedy entitled *The Scholar,* performed there in 1636, and a tragedy entitled *The Soldier,* written during the second Scottish expedition (1640), have been lost. While in prison Lovelace prepared for the press a volume of poems which appeared in 1649, under the title *Lucasta.* Of these beautiful lyrics the most famous are "Going to the Wars," and "To Althea from Prison." Lovelace died in poverty in 1658. In 1659 appeared *Posthume Poems of Lovelace.* Lovelace's poems were edited by Hazlitt (London, 1864).

LOVE LIES A-BLEEDING. A tragedy. See Philaster.

LOVE-LIES-BLEEDING. A garden plant. See Amaranth; and Plate of Acanthus.

LOVELL, lŭv'el, James (1737-1814). An American patriot, born in Boston. He graduated at Harvard in 1756, and became a teacher in his father's celebrated grammar school in Boston. Unlike his father, he espoused the Patriot cause in the pre-Revolutionary disputes between Great Britain and her colonies, and in 1771 delivered the first anniversary oration on the Boston Massacre. Upon the British evacuation of Boston he was carried as a prisoner to Halifax, but in November, 1776, was exchanged. He was a member of the Continental Congress from December, 1776, until 1782. He failed to comprehend Washington's great ability, and assisted in the attempt of the so-called Conway Cabal (q.v.) to put General Gates in supreme command. From 1784 to 1788 he was receiver of taxes in Boston; from 1788 till 1789 was receiver of the port of Boston, and then became the naval officer of Boston and Charlestown.

LOVELL, John (1710-78). An American educator. He was born in Boston; graduated at Harvard in 1728; was appointed assistant in the Boston Latin School in 1729, and master in 1734. The latter position he held until 1775, when the school was suspended by the siege of Boston. During this long period the stern, yet popular, old scholar was familiarly called 'Master Lovell,' and among his pupils were many leaders of the Revolution. At the dedication of Faneuil Hall in 1743 he was the chosen orator. He was, however, a Loyalist, and with the British troops left Boston in 1776, going to Halifax, where he died. His portrait by Smibert is in the gallery at Harvard.

LOVELL, Mansfield (1822-84). An American soldier, born in Washington, D. C. He graduated at the United States Military Academy in 1842; was appointed a lieutenant of artillery, and served in the war with Mexico, becoming aide and assistant adjutant-general of General Quitman's division. In 1854 he resigned from the army, and from 1858 to 1861 was superintendent of street improvements and deputy street commissioner of New York City. In 1861 he entered the Confederate service; was made major-general, and served in command of the Department of the South, and afterwards in northern Mississippi, Georgia, and South Carolina. When the war was ended he retired to a plantation near Savannah, and after a few years went to New York as assistant engineer to Gen. John Newton in removing obstructions to navigation at Hell Gate, East River.

LOVEL THE WIDOWER. A novel by W. M. Thackeray (1861). It appeared as a serial in *Cornhill Magazine.*

LOVÉN, lô-vān′, Sven Ludvig (1809-95). A Swedish zoölogist, born in Stockholm. He graduated at Lund, and later studied at Berlin. In the interests of science he traveled through Norway, explored the coasts of Sweden and Finland, and in 1837 led the first scientific expedition to Spitzbergen. In 1841 he was appointed professor and intendant in the State Museum of Natural History in Stockholm. He devoted himself to the study of anatomy and physiology of sea fauna. His chief works are *Études sur les échinoides* (1875) and *On Pourtalesia, a Genus of Echinoidea* (1883).

LOV′ER, Samuel (1797-1868). An artist and author, born in Dublin, Ireland, February 24, 1797. He began his career as a miniature painter, and attracted considerable attention, especially by his portrait of Paganini exhibited at the Royal Academy in 1833. He had by this time gained favor by several ballads, among which was the famous *Rory O'More* (1826). From songs he turned to sketches and novels of Irish life, characterized by farcical humor. Among them are: *Legends and Stories of Ireland,* with etchings by the author (1831); *Rory O'More, a National Romance* (1837), which was dramatized by himself and proved most popular on and off the stage; *Handy Andy* (1842); and *Treasure Trove* (1844). His success with the stage led him to write several plays; and he continued to compose verse, publishing *Songs and Ballads* (1839). In 1844 he devised an entertainment of songs, recitations, and stories, called 'Irish Evenings,' which he performed with much success in England, Canada, and the United States. His last years were devoted mostly to song-writing. He died at Saint Helier's, July 6, 1868. Consult: *Works,* with introduction and notes by O'Donohue (6 vols., New York, 1900), and *The Novels, Irish Legends, Plays, and Poems of Samuel Lover,* with an introduction by James Jeffrey Roche (Boston, 1902).

LOVERE, lô-vā′rȧ. A city of Italy. See Iseo, Lake.

LOVERING, lŭv′ẽr-ĭng, Joseph (1813-92). An American scientist, born in Boston. He was educated at Harvard University, and in 1838 was made Hollis professor of mathematics and natural philosophy. This chair he held until 1888, when he was appointed professor emeritus, after fifty years' service in the faculty. He was acting regent of the university (1853-54) and succeeded Felton as regent. He was director of the Jefferson Physical Laboratory from 1884 to 1888, and was associated with the Harvard Astronomical Observatory, especially in the joint observations of the United States and the London Royal Society on terrestrial magnetism.

LOVER'S PROGRESS, The. A play by Fletcher and Massinger, printed in 1647. The play, founded on Daudiguier's novel, *Lysandre et Caliste,* was altered from one 'long since writ,' no doubt the *Wandering Lovers,* licensed in 1623. It is identical with *Cleander,* 1634, and was probably entered in the Stationer's Register in 1653 under the title *The Wandering Lovers, or the Painter.*

LOVE'S LABOUR'S LOST. A comedy by Shakespeare, printed 1598. The earliest of Shakespeare's dramatic works, it was written probably in 1590. The source is unknown, and the plot apparently not borrowed. The comedy was revised for a Court entertainment in 1597 as "A pleasant, conceited comedy called 'Love's Labour's Lost,' as it was presented before Her Highness this last Christmas. Newly corrected and augmented by W. Shakespeare." This proves that an earlier version existed, and is the first time that Shakespeare's name appears on the title-page of a play.

LOVE'S LAST SHIFT; or, The Fool in Fashion. A comedy by Colley Cibber (1695), of which Vanbrugh's *Relapse* was an extension.

LOVES OF THE ANGELS. A poem by Thomas Moore (1822). The subject is the same as Lamartine's "Chute d'un Ange."

LOVE'S PILGRIMAGE. A romantic comedy by Fletcher, written probably in 1612, printed in 1647. The plot was taken from Cervantes's novel *Las dos doncillas.* The first part is an alteration of Jonson's *New Inn,* and some help may have been given by Webster. Fleay considers the comedy the same as the *History of Cardenio,* or the lost play *Cardano,* which Bullen denies.

LOW, Sampson (1797-1886). An English publisher, born in London. In 1837 he was made manager of the new trade journal, *The Publisher's Circular,* which became his own property in 1867, and which was the basis of his *British Catalogue,* beginning in 1853. His publishing house was opened in 1848. He compiled: *Low's Comparative Register of the House of Commons, 1827 to 1841, and 1841 to 1847* (2 vols., 1841 and 1847); an *Indew to Current Literature* (1859-60); and *Low's Literary Almanack* (1873). His two sons, Sampson (1822-71) and William Henry (?-1881), both took an active share in the business of the firm.

LOW, Seth (1850—). An American educator and administrator. He was born in Brooklyn; graduated at Columbia College in 1870, and after a short trip abroad, entered the tea and silk house of A. A. Low & Brothers, founded by his father in New York. In 1875 he was admitted a member of the firm, from which, upon its liquidation in 1888, he withdrew with a large fortune. In 1882 he was elected Mayor of Brooklyn by a fair majority on an independent ticket. His administration was characterized by his application of the civil-service system to city offices and the impartial maintenance of efficient service among appointees. In 1884 he was elected to a second term, which expired in 1886. In 1890 he was elected to succeed Dr. F. A. P. Barnard (q.v.) in the presidency of Columbia College. Not a trained scholar, nor an educator in the specific meaning of the word, he succeeded by his administrative skill in transforming the institution. He increased the college proper in resources, attendance, and general reputation; transferred the site of the institution to the valuable property on Morningside Heights, and vitally united the various schools into one organization, with the title of university, and under the direction, not as theretofore of the respective faculties, but of a university council. Further reforms effected by him include the reorganization of the Law School, the addition of a faculty of pure science, the association with the university of the Teachers College, and the extension of the department of political and social study. He also made to the university a gift of $1,000,000, to be used for the erection of a library building. In 1897, despite the opposition of the organizations of the two great parties, he received 150,000 votes as independent candidate for Mayor of New York City. He was a member of the American delegation to the Czar's Peace Conference at The Hague in 1899, and at various times held other posts of public trust. In 1901, when the revolt against Tammany Hall had become general, he was elected Mayor of New York City on a fusion ticket, whose candidates were pledged especially to break up police corruption, and despite many difficulties, due to the effects of the Tammany administration, was able to announce, through a message appearing in the public prints of February 17, 1903, progress in the several municipal departments. He was a founder and the first president of the Bureau of Charities of Brooklyn, and was elected vice-president of the New York Academy of Sciences and president of the American Archæological Institute. His academic dignities include, among others, the degree of LL.D., conferred by the University of the State of New York, Harvard, and Princeton.

LOW, Will Hicock (1853—). An American illustrator, figure and genre painter. He was born May 31, 1853, at Albany, N. Y. His early education was interrupted by ill health, but in 1870 he went to New York, and for two years illustrated for different magazines. He went to Paris in 1873, studying with Gérôme at the Ecole des Beaux-Arts, and later with Carolus-Duran. His work was also influenced by association with Millet and other painters at Barbizon. Returning to America in 1877, he was elected member of the Society of American Artists in 1878, and an Academician in 1890, being instructor of the life classes at the National Academy from 1889 to 1892. He worked with John La Farge in glass-painting, and received a second-class medal at the Paris Exposition in 1889.

Low is best known by his illustrations for the periodicals, his decorative work for public buildings, and his stained-glass work. His work shows grace of line, delicate color, and good composition. He represents American life and character in a realistic way, while his ideal subjects of gods and nymphs are painted with great charm of color reflections in light and shade. The following are some of his most important works: "Portrait of Albani" (1877); "Chloë" (1882); "Telling the Bees" (1885); "May Blossoms" (1888) (Smith College, Northampton, Mass.); "Brookside" (1890); "My Lady" (Lotus Club, New York); "Front Yard" (1891); "Aurora" (1894); "Spring" (1895); "Homage to Venus," mural painting (Waldorf-Astoria, New York); "Mother and Child," stained-glass window (Rock Creek Church, Washington); ten stained-glass windows for Saint Paul's Methodist Episcopal Church, Newark, N. J.; illustrations for Keats's *Lamia* and *Odes and Sonnets*.

LOWAN. See Mound-Bird.

LOW ARCHIPELAGO, or Paumota, Paumotu, or Tuamotu Islands. A group of low coral islands in Oceanica, lying east of the Society Islands, about latitude 14° to 24° S. and longitude 135° to 149° W. (Map: World, L 7). It consists of numerous islets, partly uninhabited, with a total area of over 360 square miles. Owing to the coral surface and scarcity of water, the vegetation is scanty. In the western islands are found the bread-tree, banana, and pineapple. The chief products of the group are copra, trepang, cocoanut oil, and pearls, and the trade is chiefly with Tahiti. The inhabitants, numbering about 7000, are Polynesians, and mostly Christian. The principal port and seat of administration is Fakarava, on the western island of Fakarava. The group was discovered by the Spaniard Quiros in 1606 and visited by many explorers, including Cook (1769). It came under the protection of France in 1844, and was officially annexed in 1881.

LOWBEY. The so-called gypsies of Northwest Africa, a branch of the Fulahs (q.v.), wandering about and accepting the laws and religion of their adopted homes.

LOW COUNTRIES. An English equivalent of Netherlands (or more especially the western portion), and also sometimes used to denote the Spanish, later Austrian, Netherlands—that is, Belgium.

LOW'DER, Charles Fuge (1820-80). An English clergyman, famous for his successful work among the poorest classes of London. He was born at Bath; graduated at Oxford in 1843; joined the mission of Saint George's in the East, London (1856); became Vicar of Saint Peter's, London Docks (1866); died at Zellam See, Austrian Tyrol, September 9, 1880. His story is told by himself in *Twenty-one Years in Saint George's Mission* (London, 1877), and in his biography (London, 1882).

LÖWE, lẽ'*ve*, Karl (1796-1869). A German composer, born at Löbejün, near Halle. He received his musical education at the Francke Institut, Halle, after which he studied under Türk, and in 1814 entered the Singakademie. A few years later he took up the study of theology, and during the same period (1817-19) produced the cantatas *Treuröschen*, *Erlkönig*, and *Wallhaide*. After this he became Cantor of Saint Jacob's Church, Stettin, and teacher at the gymnasium (1820). In 1866 he moved to Kiel. Löwe was one of the first to give artistic form to the ballad. He had a sympathetic voice, which, together with an admirable technique and a thorough mastery of dramatic expression, enabled him to make his song compositions popular throughout the world. His compositions include the opera *Die drei Wünsche* (1834), 17 oratorios, most of them in manuscript, and 127 songs and other works. An excellent selection of his songs has been published by Peters and Schlesinger (Germany) in the well-known two Löwe Albums

(20 and 16 songs respectively), in which collection are included "Archibald Douglas," "Tom der Reimer," "Olaf," "Erlkönig," "Heinrich der Vogler." He died at Kiel.

LOWE, lō, Sir Hudson (1769-1844). A British general, Governor of Saint Helena during the captivity of Napoleon I. He was born at Galway, Ireland. His childhood was spent in the West Indies, where his father held a military appointment. Having entered the army, he served in Corsica, and subsequently at Lisbon and in Minorca. On the renewal of the French War, after the Peace of Amiens, he was appointed to the chief military command in the island of Capri. Unsupported, he was obliged to surrender to the French, October 16, 1808. He afterwards served with distinction under Blücher. His knighthood followed his adventurous ride, with one attendant, when he brought the first news to London of the fall of Paris in 1814. On August 23, 1815, he was appointed Governor of Saint Helena, with the rank of lieutenant-general. He arrived there on April 14, 1816, Napoleon having been landed on the island in October of the previous year. He exercised very careful vigilance against the intrigues of Napoleon and his staff. On the death of Napoleon, Lowe returned to England. In 1822 Barry Edward O'Meara, who had been physician to Napoleon at Saint Helena, published *Napoleon in Exile,* an arraignment of Lowe for his severity toward the prisoners. Lowe took legal action against O'Meara, but the physician was discharged on technical grounds. In 1825 Lowe was appointed military commander in Ceylon, whence he returned to England in order to refute the adverse criticism of him suggested in Scott's *Life of Napoleon.* He died in London, in comparatively poor circumstances. Consult: Forsyth (editor), *Captivity of Napoleon at Saint Helena, from the Letters and Journals of Sir Hudson Lowe* (London, 1853); Seaton, *Sir Hudson Lowe and Napoleon* (London, 1898); O'Meara, *A Voice from Saint Helena* (London, 1822); Lord Rosebery, *Napoleon, the Last Phase* (New York, 1900).

LOWE, John (1750-98). A Scotch poet, born at Kenmure, East Galloway, in Scotland, being the son of a gardener. In youth he was a weaver's apprentice, but later he studied the classics at Edinburgh University, and theology, while supporting himself by private teaching. He is best known as the author of a lyric entitled "Mary's Dream." He emigrated to the United States in 1773, and became a tutor to the family of a brother of George Washington. He married the sister of a beauty who had jilted him and died unhappy. Consult Gillespie, *Life of Lowe, in Cromek's Remains* (London, 1810).

LOWE, Robert, Viscount Sherbrooke (1811-92). An English politician. He was born December 4, 1811, at Bingham, Nottinghamshire, and was educated at Winchester College and at University College, Oxford. He became known as a debater, and later was elected a fellow of Magdalen College. Admitted to the bar in 1842, he immediately went to Australia, and soon took a leading part in the political struggles of the colony. In 1843 he was nominated to a seat in the Legislative Council of New South Wales, and won renown as a leader in educational and financial questions, as an opponent of the existing land monopoly, and of the policy of sending convicts to Australia. He amassed a large fortune, and in 1850 he returned to England with the design of entering upon a Parliamentary career. In 1852 he was elected to Parliament for Kidderminster, and in the same year became joint secretary of the board of control, but lost this office with the fall of the Aberdeen Ministry in 1855. Nevertheless he was soon reinstated, and in 1859 became virtual Minister of Education in Lord Palmerston's Administration, but resigned in 1864 on account of a censure voted by the House of Commons through a misunderstanding of his actions. His emancipation from the restraints of office exhibited Lowe in a new phase. No speaker in Parliament, during the session of 1865, was so logical, so original, and so daring. In 1866, on the introduction of the Whig Reform Bill, Lowe delivered a series of powerful speeches, which largely contributed to its rejection. He was offered, together with the other Adullamites (q.v.), a post in the Derby Government, but he declined to leave the Liberal Party, though describing himself as an outcast from it. When the Derby Government in 1867 attempted to deal with the reform question, Lowe, in a series of speeches, vindicated his consistency as an opponent of all extension of the suffrage. In 1868 Lowe's feud with the Liberal Party was forgotten in the strenuous aid he gave to resolutions in the House of Commons for the disestablishment of the Irish Church. Accordingly in December of that year, when a general election brought the Liberal Party into power, with Gladstone as Prime Minister, Lowe was appointed Chancellor of the Exchequer. In September, 1873, he became Home Secretary. He was Home Secretary for too short a period to test his fitness for that trying office. As Chancellor of the Exchequer, Lowe's chief reforms were the substitution of license duties for the assessed taxes, a change in the time of collecting the income tax, and a great reduction of the sugar duties. With the fall of the Gladstone Ministry in 1874, Lowe ceased to occupy a prominent public position, though he still spoke at times. In 1880 he was raised to the peerage as Viscount Sherbrooke. Lowe's oratory was deficient in passion; but in acuteness, in felicity of illustration, in force of sarcasm, and in cogency of argument, he was almost unequalled among the public speakers of his day. For his Australian career, consult: Parkes, *Fifty Years of Australian History* (London, 1892); Hogan, *Robert Lowe, Viscount Sherbrooke* (London, 1893). His career in England may be studied in Hansard, *Parliamentary Debates;* Martin, *Life of Lord Sherbrooke* (London, 1893).

LÖWE, lẽ've, Wilhelm. See Loewe, Wilhelm.

LOWELL, lō'el. An important manufacturing city, and one of the county-seats of Middlesex County, Mass., 26 miles northwest of Boston; at the junction of the Merrimac and Concord rivers, and on the Boston and Maine and the New York, New Haven and Hartford railroads (Map: Massachusetts, E 2). The city has an area of about 12½ square miles. It is regularly laid out, and offers many points of interest, including the Ladd and Whitney Monument, Fort Hill Park, Pawtucket Falls, Rogers Street stone arch bridge, the city hall, Memorial Building, high school, Saint Anne's Church, and the great industrial establishments. Among the institutions are a State Normal School, the Lowell Textile School, Rogers Hall School, a public library of over 65,000 volumes, Saint John's Hospital, Lowell Hospital, Lowell General Hospital, Old Ladies' Home, Ayer Home for Young Women and Children, and the Theodore Edson Orphanage.

Lowell is one of the greatest textile manufacturing cities in the United States. It derives immense water-power from the falls of the Merrimac River (32 feet), and that afforded by the Concord is also utilized by several mills, though steam is largely employed in many important plants. The textile establishments include cotton, woolen, worsted, knitting, hosiery, felt, and carpet mills, and bleaching and dyeing works. Other extensive manufactures are cartridges, machinery, various kinds of tools, and patent medicines. The government is vested in a mayor, annually elected, who appoints the board of police and, with the consent of the council, the board of health, library and cemetery trustees, and registrars of voters; and a bicameral council which controls elections of all other administrative officials except the chief of department of supplies, school committee, and overseers of the poor, all of whom are chosen by popular election. Lowell spends annually, in maintenance and operation, over $1,300,000, the principal items of expenditure being about $325,000 for schools, $135,000 for the police department, $120,000 for hospitals, asylums, almshouses, etc., $115,000 for the fire department, and $85,000 each for municipal lighting and for the water-works. The city owns and operates the water-works, which were built in 1873 at a cost of over $2,850,000, the entire system now comprising 128 miles of mains. Population, in 1830, 6474; in 1850, 33,383; in 1870, 40,928; in 1880, 59,475; in 1890, 77,696; in 1900, 94,969, including 40,974 persons of foreign birth and 136 of negro descent.

Lowell was founded by the 'Merrimac Manufacturing Company' in 1822, and named after Francis C. Lowell (q.v.). The village grew very rapidly from the first. In 1826 it was incorporated as a town and ten years later was chartered as a city. Consult: *Illustrated History of Lowell, Massachusetts* (Lowell, 1897); Drake, *History of Middlesex County* (Boston, 1880).

LOWELL, Abbott Lawrence (1856—). An American publicist, born in Boston, Mass. He graduated at Harvard in 1877 and at the Harvard Law School in 1880, after which he practiced law in Boston until 1897. From 1897 to 1899 he was a lecturer on government in Harvard University, and in the latter year was elected to the newly established professorship of the science of government in that institution. His publications include: *Transfer of Stock in Corporations* (1884), with Francis C. Lowell; *Essays on Government* (1889); *Government and Parties in Continental Europe* (2 vols., 1896), recognized as the best single work on the European governments in the English language; and *Colonial Civil Service* (1900).

LOWELL, Charles (1782-1861). An American minister. He was born in Boston, studied at Andover, and was graduated at Harvard in 1800; he studied law and afterwards theology, spending two years in Edinburgh. In 1806 he was settled over the West Church (Congregational) in Boston, with which he remained connected till his death. When the controversy between the orthodox and the Unitarians arose he refused to join either party, or to take a sectarian name, and did what he could to prevent a division. His church became Unitarian. His health declining, after 1837 he preached only occasionally. He was a graceful and forcible rather than a learned orator, and was a zealous opponent of slavery. He published two volumes of sermons (1855), and devotional books. He was the father of James Russell Lowell and Robert Traill Spence Lowell.

LOWELL, Charles Russell (1835-64). An American soldier. He was born in Boston; graduated at Harvard in 1854; spent some time in Europe; engaged in business on his return; and in 1861, soon after the outbreak of the Civil War, entered the Federal Army. He served throughout the Peninsular campaign, as captain on General McClellan's staff. He then organized the Second Massachusetts Cavalry, of which he became colonel in April, 1863; and subsequently, as commander of a cavalry brigade, he fought various engagements with Mosby's Confederate troops and served with marked efficiency under Sheridan in the Shenandoah Valley. For services in this latter campaign he was promoted to be brigadier-general in October, 1864. Early in the battle of Cedar Creek he was wounded, but refused to retire from the field, and in the moment of victory received additional wounds which proved fatal.

LOWELL, Edward Jackson (1845-94). An American historian. He was born in Boston, Mass., and graduated at Harvard in 1867. After several years spent in study and travel in Europe he returned to America and began the practice of law in Boston, finally abandoning his profession to devote himself to literary work. His first published work of importance was *The Hessians and Other German Auxiliaries of Great Britain in the Revolutionary War* (1884). Among his other publications are: *The Eve of the French Revolution* (1893); the chapter on "Diplomacy of the American Revolution," in Winsor, *Narrative and Critical History of America* (Boston, 1886-89); and numerous magazine and review articles.

LOWELL, Francis Cabot (1775-1817). An American merchant and manufacturer, the founder of the cotton-manufacturing industry in America. He was born in Boston, the son of Judge John Lowell (q.v.), graduated at Harvard in 1793, and entered upon a mercantile career in Boston. While traveling in England he became convinced that cotton manufacture could be profitably carried on in America, and during the War of 1812, when the necessity for cotton cloth became pressing, he had cotton-looms constructed from his own models and started some cotton-mills, first at Waltham and later on the Merrimac River at a place since named Lowell in his honor.

LOWELL, James Russell (1819-91). A distinguished American poet, essayist, and diplomat. He was born at Cambridge, Mass., February 22, 1819, and died there August 12, 1891. The family had long been eminent in and about Boston, where his father, the Rev. Charles Lowell, was minister of a Unitarian church. He entered Harvard College, where all his male ancestors in the direct line seem to have studied, in his sixteenth year, and was poet of his class on its graduation; his poem was anonymously printed in 1838. He then entered the law school of the university, but, though he finished the course, he found the study of law so uncongenial that he never seriously practiced the profession. His bent was literary. In 1841 he published his first volume of poems, *A Year's Life*. This was followed, in 1844, by a collection of poems, including the "Legend of Brittany," and other academic pieces in the style of Keats. The same year he married Maria White, of Watertown, Mass. (see below), whose high character and earnestness quickened his own humanity, and led him to use his pen in the service of good movements. In 1846 he printed in the Boston *Courier* the first of the *Biglow Papers*, published in book form in 1848, a series of satirical poems directed against the Mexican War. The Yankee dialect verse became immediately popular, and Lowell began to win wide recognition. Besides his poems he had already published *Conversations on Some of the Old Poets* (1845), a series somewhat antique in form, but displaying an unusual amount of critical ability. In 1848 he increased his reputation by "A Fable for Critics" (anonymously published), a rambling poem, full of brilliant wit and striking puns, and also keen critical judgments of contemporary writers then just rising into fame, such as Emerson, Hawthorne, Poe, and others. The same year appeared a volume of miscellaneous poems, and also what is probably the most popular of his more academic pieces, "The Vision of Sir Launfal."

The period of his best prose work began about 1855, the year when he was appointed to succeed Longfellow as Smith professor of modern languages at Harvard College, a position which he held till 1877. In 1857 he married his second wife, the accomplished Miss Frances Dunlop, of Portland. The same year he became editor of the *Atlantic Monthly*, a post which he held until 1862. From 1864 to 1872 he was joint editor of the *North American Review*. In the pages of these magazines many of his best literary and critical essays appeared. They were printed in book form in *Fireside Travels* (1864), a series of descriptive and reminiscent sketches; *Among My Books* (1870); *My Study Windows* (1871); and the second series of *Among My Books* (1876). Meanwhile Lowell continued writing poetry. From 1862 to 1866 *The Atlantic* published the second series of the *Biglow Papers* (book form, 1867), directed against the slavery party of the Civil War. In 1865 he delivered, at the memorial services in honor of Harvard students and graduates who had fallen in the war, his "Commemoration Ode," his most dignified and serious poem, considered by many one of the best American poems. Other volumes of verse were *Under the Willows* (1869); *The Cathedral* (1870); and *Three Memorial Poems*, the last named containing the famous tributes to Lincoln, Washington, and America that make Lowell the most conspicuous poet of American patriotism (1877).

In 1877 Lowell was appointed Minister to Madrid by President Hayes, and in 1880 was transferred to London, where he served with distinction till 1885. While in England he delivered several admirable speeches, which were published later as *Democracy, and Other Addresses* (1887). In 1888 appeared his last volume of verse, *Heartsease and Rue*, and the same year a volume of *Political Essays*. The year after his death the ten volumes of his revised and complete works were supplemented by his *Latest Literary Essays and Addresses*, and by a series of lectures which he had delivered in Boston in 1887, called *The Old English Dramatists*, both edited by Charles Eliot Norton. In addition to the volumes enumerated, Lowell edited the works of several English poets, as Keats (1854); Wordsworth (1854); Shelley (1857); and Donne (published 1895); he also edited, among other prose writings, the *Compleat Angler* of Walton (1889).

Lowell appears in American life and letters in many rôles. He is a poet, a critic, an essayist, a public speaker, a diplomat. His poetry is varied and uneven. His earlier verse is often imitative, academic, and sentimental. Much of his later work is more serious in spirit and more genuine in feeling, yet often phrased in verse presenting much the same appearance of unevenness. The explanation is that most of Lowell's verses, aside from the rather conventional poems of sentiment, were written for immediate effect, as with a view to reform, and the native weapons of abundant humor, a rich and varied vocabulary, and a wealth of imagery made a rapid, unstudied expression best suited to his purposes, and rendered him most effective with his readers. As a poet, he is essentially vigorous, richly endowed with wit and humor, writing with very little conscious artistic sense. He is indeed one of the foremost of American poets, but he gains his place and reputation, not by the artistic and agreeable phrasing of common sentiments dear to the heart of the people, as Longfellow; nor as Emerson, by depth and isolation; nor as Poe, by unrivaled sense of form; nor as Bryant, by dignity; nor as Whittier, by fervor; but through the native vigor of his expression, and the sound common sense of his ideas. He has produced some of the best verse that has appeared from the hand of any distinguished American, and he has also produced some of the worst. Among the most even and excellent of his poems are "The Vision of Sir Launfal," "She Came and Went," "The First Snowfall," "After the Burial," and the "Commemoration Ode." Among the most characteristically humorous are some of the verses from the *Biglow Papers*, as "The Courtin'," and "A Fable for Critics," and "In the Half-Way House." Undoubtedly the most original and effective poetry he ever wrote is to be found in the *Biglow Papers*, which combine shrewd satire and sound political judgment and hearty patriotism to an extent rarely paralleled in literature. The *Memorial Poems*, though less racy and original, are scarcely less effective.

Lowell is probably better known as a prose writer than as a poet. His prose groups itself mainly in the three classes of critical essays, descriptive and reminiscent sketches, and political lectures and addresses. As a critic Lowell had in his day no serious rival among his countrymen. He was a man of wide and thorough reading, and in the course of his life became acquainted with all that is best in the literatures of Europe. His wide reading was supplemented by an excellent memory and by a genuine enthusiasm for literature. His work as a critic came at a time in the history of American letters when deeper interest was awakening in art and scholarship. Longfellow had previously done a great service to his country by arousing it to an appreciation of the beauty and the traditions of Europe.

The work of Lowell, in a way, supplemented this. He interpreted for his public the spirit of authors then not widely read in America. His essays on Dante, Shakespeare, Chaucer, Dryden, and other poets, the main facts of whose lives and whose significance have now become literary commonplaces, were a new and fresh handling of delightful subjects. The temper in which these essays were written was not that of the contemporary accumulative study of literature, but of an enthusiastic attempt to enter into the spirit of these men and expound their significance. The personality of Lowell, though not obtrusive, is so constantly present that the essays may be called literature as justly as criticism. The specific ideas and details are often very elusive and are easily forgotten, there is little grasping of principles to be afterwards applied, but the impression of the author and his attitude remains. Indeed, it may probably be said that although Lowell is scarcely a great critic in the radical sense of that term, few writers have excelled him in conveying to readers a sense of the flavor of the best books and of the personality of their authors.

The sketches and political writings are of less importance. The former comprise such essays as *A Moosehead Journal, Leaves from My Journal in Italy and Elsewhere, Cambridge Thirty Years Ago, My Garden Acquaintance,* and *A Good Word for Winter. On a Certain Condescension in Foreigners* is a dignified and emphatic protest against the attitude of Europeans toward the United States. The essay is perhaps the clearest expression of Lowell's patriotism. Its mood is that of a believer in his country. He was no blind worshiper of numbers or of the power of the masses, but he had faith in the nobility of the founders of America and enthusiasm for institutions capable of producing men of the temper and character of Lincoln and Emerson. Such also is the attitude underlying the political addresses and essays, published in the volumes entitled *Democracy* and *Political Essays.* His address on *Democracy,* delivered at Birmingham, England, in 1884, has scarcely been surpassed for lofty faith in mankind, combined with keen insight into the nature and functions of government.

The manner of Lowell, alike in poetry and prose, is difficult and uneven. His prose is often charged to the point of turgidity with literary and historical allusion and reference. His early prose seems to be the outpouring of a full mind, often provokingly unaware of its superfluity. Toward the end of his life, as in *The Old English Dramatists,* his style became more terse, and these essays are much more simple and straightforward, and the superabundant brilliance of figure is much more restrained, but they are rather a series of interesting thoughts about the subject in hand cast into a semblance of unity. Consequently the essays are difficult to grasp as connected wholes, and are frequently more memorable for their brilliancy of detail than for sustained intellectual power. In the main, however, no American critic has had so much influence as he, and in occasional power and insight he may be placed with the most eminent of his critical contemporaries.

Bibliography. The best edition of the complete works of Lowell is the Riverside (11 vols., Boston, 1890-91). The letters have been edited in two volumes by Charles Eliot Norton (New York, 1894). There is a *Biographical Study* by F. H. Underwood (Boston, 1893), and a life by Edward Everett Hale, entitled, *James Russell Lowell and His Friends* (Boston, 1899); and one by H. E. Scudder, entitled *James Russell Lowell, a Biography* (ib., 1901). A short sketch, by E. E. Hale, Jr., is to be found in the "Beacon Biographies Series." Personal reminiscences of Lowell occur in Howells's *Literary Friends and Acquaintance* (New York, 1900); critical estimates in Stedman's *Poets of America* (Boston, 1885), and in the work of other literary historians, as Richardson, *American Literature* (New York, 1887-88), and Wendell, *A Literary History of America* (New York, 1900).

LOWELL, John (1743-1802). An American jurist. He was born at Newburyport, Mass.; graduated at Harvard in 1760; was admitted to the bar in 1762, and rapidly attained prominence in his profession. He was an enthusiastic patriot, took an active part in the pre-Revolutionary movement in Massachusetts, and after the outbreak of hostilities served for a time as a lieutenant of Massachusetts militia. In 1776 and again in 1777 he was elected from Newburyport to the Provincial Assembly. In 1780 he was a delegate to the State Constitutional Convention, and took a prominent part in drafting the Constitution which was adopted. He is said to have been the author of the declaration in this instrument that 'all men are born free and equal,' which was held by the State Supreme Court in 1783 to have abolished slavery in Massachusetts. In 1782-83 he was a member of the Continental Congress, and in 1782 was appointed by that body one of the three judges to try appeals from the local courts of admiralty. In 1784 he was a member of the New York-Massachusetts Boundary Commission, and in 1789 was appointed by President Washington the first judge of the United States District Court in Massachusetts, which office he held until his death.

LOWELL, John (1769-1840). An American political pamphleteer, born at Newburyport, Mass. He graduated at Harvard in 1786; was admitted to the bar in 1789; took up his residence in Boston, became eminent as a lawyer, and was an active, honored, and public-spirited citizen, but refused to take office. He was the author of about twenty-five pamphlets upon the current topics of his time, including: *Peace Without Dishonor—War Without Hope* (1807); *Candid Comparison of the Washington and Jefferson Administrations* (1810); and *Mr. Madison's War* (1812). He was for many years president of the State Agricultural Society, and for his interest and success in horticulture was known as 'the Columella of the New England States.'

LOWELL, John (1799-1836). An American philanthropist. He was born in Boston, the grandson of Judge John Lowell, was educated in Edinburgh, Scotland, and at Harvard, and spent the years 1816-17 in travel in India and the East. He was then engaged in commerce in Boston until 1831, when he retired from business, and spent the rest of his life in study and travel. He was a man of literary culture, and at his death left a fund of $250.000 to found the famous 'Lowell Institute' at Boston, which provides for annual courses of free lectures. Consult Edward Everett, *Memoir of John Lowell, Jr.* (Boston, 1840).

LOWELL, JOSEPHINE (SHAW) (1843-1905). An American philanthropist and author, born at West Roxbury, Mass. She was educated in New York, Boston, and Europe, and in 1863 married Col. Charles Russell Lowell, who was killed in the battle of Cedar Creek, Va., 1864. She was appointed by Governor Tilden Commissioner of the New York State Board of Charities and was reappointed by several succeeding Governors, her period of service extending from 1877 until 1889. After retiring from the State board she engaged in other charitable works. She published: *Public Relief and Private Charity* (1884); and *Industrial Arbitration and Conciliation* (1893).

LOWELL, MARIA (WHITE) (1821-53). The first wife of James Russell Lowell, whom she married in 1844. She was born in Watertown, Mass., July 8, 1821, and died in Cambridge, October 27, 1853. Mrs. Lowell is known in American letters for her writings against slavery, for her influence on her husband in the cause of abolition, and for the beauty and sincerity of her character. Her poems, of which the best known is probably "The Morning-Glory," a simple and tender lyric, were privately printed in 1855.

LOWELL, PERCIVAL (1855—). An American traveler, astronomer, and author, born in Boston, March 13, 1855. Lowell was educated at the Boston Latin School and at Harvard University, from which he graduated in 1876. He then passed some years in Japan and Korea, the literary fruits of which are: *Choson: The Land of the Morning Calm* (1885), a sketch of Korea; *The Soul of the Far East* (1886); *Noto, an Unexplored Corner of Japan* (1886); and *Occult Japan, or the Way of the Gods* (1886). Lowell is known also for an historical study, *The Eve of the Revolution*, and an astronomical volume, *Mars*.

LOWELL, ROBERT TRAILL SPENCE (1816-91). An American clergyman and author. He was born in Boston; was educated at Northampton, Mass., and at Harvard University, where he was graduated in 1833, and then took a full course in the Harvard Medical School. He engaged in mercantile pursuits, but began to study theology in 1839, and to prepare for orders in the Episcopal Church. On invitation of Bishop Spencer he went to Bermuda; was ordained priest there and in 1843 appointed domestic chaplain to the bishop. Later he was transferred to Newfoundland and was put in charge of the church at Bay Robert. He returned to the United States in 1847, and began mission work in Newark, N. J., where he organized a church. In 1859 he became rector of Christ Church, Duanesburg, N. Y., where he remained ten years; then became head master of Saint Mark's School, Southborough, Mass., and in 1873 professor of the Latin language and literature in Union College. He published: *The New Priest in Conception Bay* (1858); *Fresh Hearts, and Other Poems* (1860); *Anthony Brade* (1874); *A Story or Two from an Old Dutch Town* (1878); *Burgoyne's March*, the poem of the Saratoga County Centennial Celebration at Bemis Heights, 1877. He was a brother of James Russell Lowell.

LÖWENDAL, lō'väɴ'dâl', *Ger. pron.* lẽ'ven-dâl, ULRICH FRIEDRICH WOLDEMAR, Count von (1700-55). A marshal of France, great-grandson of Frederick III. of Denmark. He was born at Hamburg; entered the service of Augustus the Strong, Elector of Saxony and King of Poland; was made field-marshal and inspector of infantry in the Saxon Army; and in 1733 defended Cracow against the attack of the Polish insurgents. For the next two years, during the War of the Polish Succession, he was in command of Saxon troops on the Rhine, and then entered the Russian Army, winning distinction in the campaigns against the Turks and Swedes. Having become a Catholic and entered the French Army, he was made a lieutenant-general and served in the Netherlands with great success. After taking Bergen-op-Zoom (September 6, 1747) he was made Marshal of France.

LÖWENTHAL, lẽ'ven-täl, JOHANN JAKOB (1810-76). An Hungarian-English chess-player, born at Budapest. By 1841 he was recognized as one of the best chess-players in Europe. In 1849 he went to the United States, where he met the chief players, including C. H. Stanley, Dudley, and Paul Morphy. In 1851 he went to London to take part in a chess tournament, and became a resident of that city, where he was employed in editing the chess department of the *Era* and of the *Illustrated News of the World*. He also edited the *Chess-Player's Magazine* from 1863 to 1867. From 1865 to 1869 he was manager of the British Chess Association. In 1860 he published *Morphy's Games of Chess with Analytical and Critical Notes*, and in 1867-69 *Transactions of the British Chess Association*. Many of his games may be found in Walker's *Chess Studies* (London, 1894) and the *Chess-Player's Chronicle*, as well as in his own *Chess-Player's Magazine*.

LOWER, lou'ẽr, RICHARD (1631-91). An English physiologist. He was born in Cornwall; was educated at Westminster School and Oxford, and studied medicine under Dr. Thomas Willis. In 1666 he went to London, where he eventually attained prominence in the practice of medicine, and became a fellow of the Royal Society and of the College of Physicians. His anatomical and physiological researches, concerned chiefly with the structure of the brain and the process of direct transfusion of blood, have permanent value. His chief publication, containing the results of the above study, is the *Tractatus de Corde* (1669).

LOWER AUSTRIA, or AUSTRIA BELOW THE ENNS. An archduchy and crownland of Austria, occupying the eastern part of the original Archduchy of Austria—the nucleus of the Austro-Hungarian monarchy (Map: Austria-Hungary, D 2). It is bounded by Bohemia and Moravia on the north, by Hungary on the east, by Styria (the Semmering Alps) on the south, and by Upper Austria and Bohemia on the west. Area, 7654 square miles. Capital, Vienna. Lower Austria is divided by the Danube, which traverses the district from west to east. The southern part belongs to the region of the Alps and slopes toward the Danube. The northern part is less mountainous and partakes of the character of the Bohemian and Moravian mountain systems. The southern portion abounds in picturesque river valleys. Among the tributaries of the Danube in the crownland are the Enns, Ybbs, Traisen, and Kamp. The March and the Leitha form part of the eastern border. There are numerous mountain lakes and mineral springs. The climate is generally moderate and agreeable. The crownland has a large percentage of productive land and yields considerable quantities of cereals and fruit. The forest area is three times greater than the meadow area, and lumber is a large item of trade. The mineral resources are unimportant. The chief mineral obtained is coal. Wild game figures rather conspicuously in the items of trade.

Lower Austria is a great industrial district. Vienna is of course the great centre of this activity. In the northern part of the crownland the house industry still prevails to a considerable extent.

The Diet is composed of 78 members, including the Archbishop of Vienna, the Bishop of Sankt Pölten, and the rector of the University of Vienna. The term of the elected members is six years. In the Lower House of Austria, the crownland is represented by 46 delegates. The population, in 1900, was 3,086,382, showing an increase of 16 per cent. for the decade, the largest increase of any Austrian crownland. The inhabitants are chiefly German Catholics. See AUSTRIA-HUNGARY; VIENNA.

LOWER CALIFORNIA. See CALIFORNIA, LOWER.

LOWER EMPIRE. A name sometimes applied to the Byzantine Empire (q.v.).

LOWER FRANCONIA. See FRANCONIA.

LOWER HELDERBERG, hĕl′dẽr-bẽrg. A term applied to a series of limestones and calcareous rocks forming the upper member of the Silurian system. The formation is prominently developed in the Helderberg Mountains of eastern New York, where it forms a bold escarpment. The prefix *lower* is used to distinguish this series of limestones from those of the Upper Helderberg, occurring in the lower part of the Devonian. The Lower Helderberg limestones are divisible into the Lower Pentamerus, Shaly limestone, and Upper Pentamerus. They are found extending southward along the Appalachians to Virginia, and are also known in western Tennessee and Missouri. Other areas are found in Eastern Canada. The Lower Helderberg rocks have a thickness of 30 to 400 feet in eastern New York and 600 feet in eastern Pennsylvania and in New Jersey, but the westward extension of them is much thinner. The economic products of the formation consist chiefly of limestone, which is used for building, lime manufacture, Portland cement, and furnace flux. The Lower Helderberg rocks contain an abundance of invertebrate fossils, and those found in the upper beds of the series represent types of such a transitional nature between the Silurian and Devonian that American geologists have experienced some difficulty in drawing the boundary line between these two systems. See SILURIAN SYSTEM.

LOWER RHENISH MUSICAL FESTIVAL (NIEDERRHEINISCHES MUSIKFEST). The most important musical festival in the world. In 1811 a Thuringian musical festival was held at Erfurt under the conductorship of Bischoff, the organist of Frankenhausen. In 1817 Johann Schornstein, who was the musical director at Elberfeld, organized a festival in which he was assisted by the musicians of Düsseldorf. Originally the Lower Rhenish festivals were held at Elberfeld and Düsseldorf alternately, but in 1821 the musicians of Cologne participated and the *Musikfest* was held in their city. In 1825 Aix-la-Chapelle was the city selected. With the single exception of 1827, when the festival was held at Elberfeld, the meetings have taken place at Düsseldorf, Aix-la-Chapelle, or Cologne.

LOWER SILU′RIAN. See ORDOVICIAN SYSTEM.

LOWESTOFT, lō′stŏft. A seaport in Suffolk, England, one of the most important fishing stations in that county, and a fashionable resort for sea-bathing (Map: England, H 4). The town is picturesquely built on the slope of the most easterly height of England, which has a lighthouse at its summit and another at its base. The town possesses a parish church of the fourteenth century, a town hall, county hall, two foundation schools, hospital, and numerous charitable institutions. There are building-yards, rope-works, and oil and flour mills. Lowestoft has a spacious harbor and a large export trade in fish. Its importance as a fishing town dates from the Roman period. In 1643 Cromwell occupied the town, and in 1665 the Dutch were defeated off the harbor, with a loss of eighteen ships. The production of the celebrated white and blue china was begun here towards the end of the eighteenth century. Population, in 1891, 23,340; in 1901, 29,800. Consult Nall, *History of Lowestoft* (London, 1866).

LOWICZ, lō′vĭch. A small town in Russian Poland, 50 miles west-southwest of Warsaw. It has a monastery, a castle, and a gymnasium. It manufactures soap, candles, leather, and flour. In the vicinity are two palaces of the counts of Radziwill. Lowicz is first mentioned in 1136. About the middle of the fourteenth century it became the capital of the Principality of Lowicz. Population, in 1897, 12,400.

LOWNDES, lounds, LLOYD (1845-1905). An American politician and capitalist, born in Cumberland, Md., and educated at Washington College, Allegheny College, and the law school of the University of Pennsylvania. He was elected to the Maryland Legislature in 1871, and in 1895 was chosen Governor of the State by the Republican Party, an office which he held for four years. He was a director and trustee of several financial concerns in Maryland and New York.

LOWNDES, RAWLINS (1722-1800). An American statesman. He was born in the West Indies, removed with his parents to Charleston, S. C., when very young, rose to eminence at the bar, and in 1766 became an associate judge of the Colonial Court, in which capacity, in the same year, he delivered the majority opinion of the court favoring the use of unstamped paper in contravention of the Stamp Act. He early took a decided stand against the aggressions of the British Ministry, and in 1775 became a member of the Committee of Public Safety. In 1776 he helped draw up the new Constitution for South Carolina, became a member of the legislative council, and in 1778 was elected president of South Carolina, assisting as such in the defense of Charleston in 1780, and becoming a prisoner upon the surrender of that city. After the close of the war he became a member of the State Legislature. When the Federal Constitution was submitted for ratification, he was one of its bitterest opponents, objecting especially to the provisions restricting the slave trade, enabling Congress to regulate commerce, and concentrating power in the hands of the Federal Government.

LOWNDES, William (1782-1822). An American political leader and legislator. He was born at Saint Bartholomew's Parish, Colleton County, S. C.; was educated in England and at Charleston; studied law, and was admitted to the bar in 1804, but practiced for only a year; and then, having married the daughter of Thomas Pinckney, retired to his plantation. Allying himself politically with the Jeffersonian Republicans, he was in 1806 elected to the South Carolina Assembly, and from 1810 until his death was a member of the National House of Representatives. As a member of the Committee on Military Affairs, he was a sharp critic of the Administration's conduct of the War of 1812, opposed the confiscation of merchants' bonds, and voted with the Federalists on some questions. In 1814 he became chairman of the Committee on Naval Affairs, a position in which he strongly opposed privateering. In the session of 1815-16, as chairman of the Committee of Ways and Means, he drew up and secured the passage, with the support of Calhoun, but in the face of violent opposition from Southern agricultural interests, of the 'Tariff of 1816,' which recognized the protective principle. At the first session of the Fifteenth Congress he secured the passage of his measure establishing a sinking fund. In 1819 he became chairman of the Committee on Foreign Affairs. He again declined the French mission, and on December 18, 1821, was nominated for the Presidency by the South Carolina Legislature—an honor which he did not refuse, but was loath to accept for fear of hurting the chances of his friend Calhoun. About this time, however, his health began to fail rapidly. On October 21, 1822, he sailed for Europe, but died on the 27th, and was buried at sea. His influence in national legislation during the critical decade 1812 to 1822 was very great, and the estimate of him reported to have been made by Henry Clay, that he was the wisest man he ever knew, gives a good idea of his standing among his contemporaries. Consult Ravenel, *Life and Times of William Lowndes* (Boston, 1901).

LOWNDES, William Thomas (c.1798-1843). An English bibliographer. He carried on the trade of a bookseller, in the Strand, London; was an enthusiastic bibliographer, and published two books of standard authority in the subjects with which they deal: *The Bibliographer's Manual of English Literature* (4 vols., 1834), and *The British Librarian or Book Collector's Guide* (1839). Only eleven parts of the latter had been completed when the author succumbed to insanity brought on by poverty and neglect. Consult Bohn's edition of the *Bibliographer's Manual* (1864), and Nichols, *Literary Anecdotes*, vol. iii. (9 vols., London, 1812-15). .

LOWRIE, lou′rĭ, Walter (1784-1868). An American legislator and promoter of foreign missions. He was born in Edinburgh, Scotland, but removed with his parents to America in 1791, and settled first in Huntingdon County, and then in Butler County, Pa. He educated himself for the ministry, but never filled a pastorate. He was a member of the Pennsylvania Senate from 1811 to 1818 and of the United States Senate from 1818 to 1824, after which he served for twelve years as secretary of the Senate. During his term as United States Senator he devoted much of his attention to religious matters, and was one of the organizers of the Congressional prayer-meeting and a Congressional total abstinence society. He was elected corresponding secretary of the Western Foreign Missionary Society in 1836, and for more than thirty years held a similar position in the Board of Foreign Missions of the Presbyterian Church. Three of his sons, John Cameron, Walter Macon, and Reuben, were prominent as missionaries to India and China.

LOWRY, Robert (1826-99). An American Baptist clergyman, born in Philadelphia, Pa. He graduated at the Lewisburg University, Lewisburg, Pa., in 1854. Afterwards he held pastorates in West Chester, Pa., in New York City, and in Brooklyn. In 1869-75 he was professor of belles-lettres at Lewisburg. From 1876 until 1885 he was pastor of a church in Plainfield, N. J. He was the author and composer of a large number of hymns and tunes, and edited many song-books, such as *Chapel Melodies* (1868) and *Chautauqua Carols* (1878).

LOW SUNDAY (so called because of its relative importance to Easter). The first Sunday after Easter. This day is also called in the Roman Catholic Church *Dominica in Albis*, because in early times those who had been baptized just before Easter usually wore white garments until this day.

LOWTH, or LOUTH, louth, Robert (1710-87). An English bishop and scholar. He was born at Winchester, November 27, 1710, the son of William Lowth (q.v.). He was educated at Winchester School, whence, with a reputation both as a scholar and a poet, he passed to New College, Oxford, in 1730. Here he took his degree of M.A. in 1737, and only four years after was appointed professor of poetry. In 1750 Bishop Hoadly conferred on him the Archdeaconry of Winchester, and in 1753 the rectory of Woodhay, in Hampshire. In the same year he published in Latin his *Lectures on Hebrew Poetry* (*De Sacra Poesi Hebræorum Prælectiones Academicæ*). This work had great influence, both in England and on the Continent, and has passed through many editions with notes and emendations (e.g. by Rosenmüller, Leipzig, 1815; Eng. trans., London, 1787; new ed. 1847). In 1755 Lowth became prebendary of Durham and rector of Sedgefield, Bishop of Saint Davids in 1766, of Oxford a few months after, of London in 1777, declined the primacy in 1783 on the score of ill health, and died in London, November 3, 1787. Besides his *Hebrew Poetry*, his two principal works are *Life of William of Wykeham* (1758) and *Isaiah, a New Translation, with a Preliminary Dissertation, and Notes, Critical, Philological, and Explanatory* (1778; 12th ed. 1842). His *Sermons and Other Remains*, with a memoir by P. Hall, appeared in London, 1834.

LOWTH, William (1660-1732). A Church of England divine, father of Bishop Robert Lowth (q.v.). He was born in London; studied at Oxford in 1679, and was Vicar of Buriton, Hampshire, from 1699 to his death. His reputation rests upon his *Vindication of the Divine Authority of the Old and New Testaments* (1692); *Directions for the Profitable Study of*

Holy Scripture (1708); and *Commentary on the Prophets* (1714-25), afterwards printed as a part of Bishop Patrick's commentary on the Old Testament and with the commentaries of Whitby, Arnold, and Lowman on the New. Consult his *Life* in the seventh edition of his *Directions for the Profitable Reading of the Holy Scriptures* (London, 1799).

LOWTHER, lou′thẽr, JAMES WILLIAM (1855—). An English politician. He was educated at King's College, London, and Trinity College, Cambridge, and in 1879 was admitted to the bar. He was returned to Parliament as a Conservative for Rutland in 1883, and in 1886 for the Penrith division of Cumberland. In 1891-92 he was Under-Secretary for Foreign Affairs, and in 1895 was appointed deputy Speaker and chairman of Ways and Means.

LOW′VILLE. A village and the county-seat of Lewis County, N. Y., 58 miles north by west of Utica; on the New York Central and Hudson River Railroad. It is the centre of the hop-growing, agricultural, and dairying interests in the county. Lowville Academy has a library of over 4000 volumes, and among the finest structures in the village are the county buildings, town hall, and the club-house. Population, in 1890, 2511; in 1900, 2352.

LOXA, lō′hȧ. The name of two towns, one in Spain, the other in Ecuador. See LOJA.

LOX′ODROME (from Gk. λοξός, *loxos*, oblique, + δρόμος, *dromos*, course, from δραμεῖν, *dramein*, to run). A line which cuts the meridians of a sphere under a constant angle. This curve, resembling the logarithmic spiral (see SPIRAL), was named the *loxodromia sphærica* by Snellius (1624). A ship continuing to sail on a given course would traverse such a line, called by navigators a 'rhumb-line' (*Rumbus*, so called by Pedro Nuñez, 1550). Since the introduction of steam navigation the geodetic line has replaced the loxodrome in practical use. The loxodrome in passing around the sphere approaches the pole nearer and nearer, but cannot reach it by a finite number of turns. For theoretical studies of the loxodrome, consult: *Nouvelles annales de mathématiques* (1861); and *Journal de mathématiques spéciales* (1885). For historical notes, consult *Bulletin des sciences mathématiques* (1879).

LOYALISTS, or TORIES. In American history, those persons in the thirteen original colonies who at the time of the Revolutionary War remained loyal to the British Government. They represented various classes and seem to have acted upon varying and widely divergent motives. In their ranks were included: (1) a large majority of the office-holders and their immediate following; (2) a large majority of those who stood for the moneyed and commercial interests of the colonies; (3) probably a majority of those who belonged to the so-called learned professions; (4) a majority of those who were conservatives by temperament or training; (5) numerous hangers-on, opportunists, and low politicians, who, believing that the revolting colonists would ultimately be subdued, ostentatiously adhered to the Crown in the hope of securing gain and preferment. With regard to the total number of the Loyalists estimates have varied widely, some writers asserting that they constituted a clear majority of the colonial population, others that they constituted at the best but a small minority. John Adams, at the close of the Revolution, estimated that fully a third of all the people in the colonies—one million out of the total population of about three millions—were opposed to the measures of the Revolution in all its stages. In New York, Pennsylvania, Connecticut, North Carolina, and South Carolina, Loyalists were found in greatest numbers. The Patriots or Whigs in all the States, being thoroughly organized and aggressive, early got the upper hand, and, advancing from social ostracism, boycott, and horseplay, passed rigorous acts against the Loyalists, banishing many, often under penalty of death, deporting many more, attainting others of treason, confiscating the estates of many, and subjecting all who remained within the American lines to a more or less constant surveillance. During the progress of the war many Loyalists fled to England or to some British possession, many took refuge in places such as New York, held temporarily by the British troops, and a large number enlisted for active duty against their fellow-colonists, frequently rendering services of great value to the British commanders. Some Loyalist companies, recruited from the lower and baser elements, committed numerous atrocities and did much to accentuate the hatred felt for the Loyalists as a class by the Whigs. In the treaty of peace closing the war the commissioners of the United States agreed that the Continental Congress should recommend to the various States the rescinding of their anti-Loyalist laws, the permitting of Loyalists to buy back their confiscated estates, and abstention from the passing of new confiscation acts or other acts directed against the lives or property of Loyalists. Congress accordingly made the specified recommendations, which, however, were little heeded by the States; and in the years immediately following the cessation of hostilities thousands of the Loyalists fled from the country, taking refuge principally in Canada, whither between 40,000 and 50,000 are said to have gone prior to 1786. It was by these emigrants, who styled themselves "United Empire Loyalists," that New Brunswick and Upper Canada (Ontario) were founded. The British Government made liberal provision for the Loyalists after the Revolution, and paid out a large sum of money to those who had "suffered in their rights, properties, and professions—in consequence of their loyalty to his Majesty and attachment to the British Government." Consult: Van Tyne, *The Loyalists in the American Revolution* (New York, 1902); Ryerson, *Loyalists of America, 1620-1816* (2 vols., Toronto, 1880); Sabine, *Biographical Sketches of Loyalists of the American Revolution, with an Historical Essay* (2 vols., Boston, 1864); Flick, *Loyalism in New York During the American Revolution* (New York, 1901); Tyler, *Literary History of the American Revolution* (2 vols., New York, 1897); Canniff, *History of the Province of Ontario* (Toronto, 1872); and a chapter, with bibliography, in Winsor, *Narrative and Critical History of America*, vol. vii. (Boston, 1888).

LOYAL LEGION OF THE UNITED STATES, MILITARY ORDER OF THE. A patriotic society, organized April 15, 1865, by officers of the army, navy, and marine corps of the United States who had fought during the Civil War, for the purpose of cherishing the memory of those who had fallen in battle for their country, for the relief of the widows and children of dead companions of the order, and for the advancement of the general welfare of the soldiers and sailors of the United States. It comprises three classes, the first of which consists of commissioned officers who had served as such in the army, navy, or marine corps of the United States during the Civil War or were subsequently commissioned to the regular forces of the United States. Members of the second class are elected from among the eldest male descendants of those eligible for the first class. The third class consists of distinguished civilians who rendered faithful and conspicuous service to the Union during the Civil War. No new elections to this class have taken place since 1890. There are at present twenty State commanderies, thus distributed in the order of seniority: Pennsylvania, New York, Maine, Massachusetts, California, Wisconsin, Illinois, District of Columbia, Ohio, Michigan, Minnesota, Oregon, Missouri, Nebraska, Kansas, Iowa, Colorado, Indiana, Washington, and Vermont. Since 1885 the supreme head of the order has been a commander-in-chief.

LOYAL TEMPERANCE LEAGUE. An organization of children, with some 200,000 members in the United States and a few in other countries, started by the Woman's Christian Temperance Union in 1886 to teach children the evil effects of alcohol, tobacco, and other narcotics. There is a course of instruction and the graduates are organized into State legions, holding annual conventions. See Temperance.

LOYALTY ISLANDS. A group of islands in the Pacific, lying east of New Caledonia, in latitude 20° 11′ to 21° 39′ S. and longitude 166° 10′ to 168° 10′ E. (Map: Australasia, J 5). It consists of the three larger islands of Lifu, Maré, and Uea and a number of small islands, with a total area of about 1050 square miles. They are mostly low and poorly watered. The climate is healthful. Bananas are cultivated to some extent and sandalwood is exported. The inhabitants, numbering 19,534 in 1889, are of mixed Melanesian and Polynesian descent and are mostly Protestants. The group has belonged to France since 1864 and is an administrative dependency of New Caledonia.

LOYOLA, lō-yō′lȧ, Ignatius of. The founder of the Society of Jesus. See Ignatius of Loyola.

LOYOLA, Martin Garcia Oñez de (c.1548-98). A Spanish cavalier, the nephew of the Jesuit founder, Ignatius Loyola, and born in Guipúzcoa. He was one of the commanders who fought in Peru against the Inca, Tupac Amaru (1572). After the Inca's capture and death Loyola married his niece, and through her got control of some of the Inca's large possessions. He was appointed Captain-General of Chile in 1592, and from this date until his death was almost constantly occupied with the Araucanian campaign. Despite his lack of men and means he came to the relief of Arauco (1583). He was finally killed by the Indians, with several of his followers, between Imperial and Angol.

LOYSON, lwä′zôɴ′, Charles, better known from his monastic name, as Père Hyacinthe (1827—). A famous French preacher. He was born at Orleans, March 10, 1827, and received his early education at Pau, where his father was rector of the academy. He studied four years at the Theological Seminary of Saint Sulpice, Paris, and was ordained priest in 1851. After ten years as professor in the seminaries of Avignon and Nantes, and as priest, he entered the convent of the bare-footed Carmelites in Lyons and, after two years of novitiate, joined that Order in 1863. He preached in several cities of France, attracting attention by his eloquence and enthusiasm. In 1864 he was called to the Madeleine in Paris and in 1865 to Notre Dame. For his boldness in denouncing what seemed to him abuses in the Church he was silenced by the general of his Order in July, 1869, and, in consequence, withdrew from the Order. His excommunication followed. Late in the same year he paid a brief visit to New York. After the Vatican Council in 1870 he joined the Old Catholic movement and was present at the congress in Munich in September, 1871. (See Old Catholics.) In 1872 he was married in London to an American lady. In 1873 he was called to Geneva by certain disaffected Roman Catholics and founded the first Old Catholic church there. Not being in full accord with all members of the party in that city, he returned to Paris the following year. In 1879 he founded in Paris the 'Gallican Church' in communion with the Old Catholic and Anglican churches. Means for the erection of a chapel were furnished from America. For a number of years he served this congregation as rector, but ultimately placed it under the charge of the 'Jansenist' Church of Holland. (See Jansenism.) Père Hyacinthe gave much of his time to travel. In 1900-01 he visited the East, and with his wife was received by several patriarchs of Oriental churches. In 1901 he resumed preaching in Old Catholic and Protestant churches of Switzerland. Père Hyacinthe's writings include: *La société civile dans ses rapports avec le christianisme* (1867); *De la réforme catholique* (1872-73); *Programme de la réforme catholique* (1879); *Liturgie de l'Eglise catholique-gallicane* (4th ed. 1883); *Mon testament* (1893). He also edited the periodical *Catholique français*.

LOZADA, or **LOSADA,** lō-sä′dȧ, Manuel (c.1825-73). A notorious Mexican bandit, born near Tepic of mixed white, Indian, and negro blood. His associations were chiefly with Indians, and he gained much influence among them. He became a cattle-thief and bandit and levied tribute on the farmers in the valleys. In the contest between the Liberal and Conservative parties he favored the latter, but was undisturbed by the Liberals while they were in power. Maximilian conciliated him and recognized his title of general. He rebelled in 1872 against the Juarez Government, but was defeated by General Corona and was finally captured and executed in 1873.

LOZANO, lō-thä′nō, Pedro (?-c.1759). A Catholic missionary, born in Spain. He entered the Society of Jesus, and was sent as missionary to South America, where he became professor in the College of Córdova at Tucumán. He published six works, of which the most important were: *Descripción corográfica de terreno, rios, arboles y animales de las dilatadísimas provincias del Gran Chaco Gualamba y de los ritas y costumbres de las innumerables naciones bárbaras é infieles que le habitan* (1733), which is now very rare; and *Historia de la Compaña de Jesus en la provincia del Paraguay* (2 vols., 1754-55). He also furnished Charlevoix with much material for the latter's histories.

LOZENGE (OF. *losenge, losange, lozenge,* quadrilateral, window-pane, cake of preserves, originally flattery, deceit, from *los,* praise, from Lat. *laus,* praise; the meaning developed from praise to flattery and epitaph, then square gravestone, and finally to square pane, cake, etc.). In heraldry (q.v.), a charge generally enumerated among the subordinaries.

LOZÈRE, lō′zâr′. A southern department of France, formerly part of the Province of Languedoc (Map: France, K 7). Area, 1996 square miles. The department is mountainous, and derives its name from Mount Lozère, a peak of the central mass of the Cévennes, here called Monts de la Margeride, which occupy the whole of the east and southeast portions. In the mountains the climate is severe and variable, and little grain is produced; but the slopes on the southern side of the Cévennes, looking toward the valley of the Rhone, are clothed with the mulberry, the olive, and the vine. The forests are extensive. The silk-worm culture is an important industry. Cattle, sheep, and mules are reared and exported in considerable numbers. The principal minerals are silver, lead, and antimony. Capital, Mende. Population, in 1896, 132,151; in 1901, 128,866; among whom are many Protestants.

LOZIER, lō′zhẽr, Clemence Sophia (Harned) (1812-88). An American homœopathic physician, born in Plainfield, N. J. After the death of her husband, Abraham W. Lozier, of New York City, she began the study of medicine in the Rochester Eclectic Medical College in 1849, and graduated at the Syracuse Medical College in 1853. She then began to practice in New York City. The lectures she gave in her own house were the beginning of the New York Medical College and Hospital for Women, founded through her efforts in 1863. She was dean of the faculty of the college for more than twenty years. Dr. Lozier was a specialist in the diseases of women and children. Her daughter-in-law, Charlotte Irene (Denman) Lozier (1844-70), was also a practicing physician in New York City.

LUALABA, lo͞o′ȧ-lä′bȧ. One of the two main headstreams of the Congo. It rises on the southern boundary of the Congo Free State almost exactly midway between the Atlantic and Indian oceans, and flows northward until after a course of 650 miles it unites with the Luapula to form the Congo (Map: Congo Free State, E 5). It flows through a mountainous and little known forest region, where it is obstructed by numerous falls and rapids. After passing through several lakes it becomes navigable for the last 250 miles of its course.

LUANG-PRABANG, lo͞o′ȧng-prä′bȧng. The capital of a native State of the same name in Laos, French Indo-China, situated at the confluence of the Nam-kan with the Mekong, about 250 miles west-southwest of Hanoi. In the centre of the town rises a hill surrounded by a pagoda. The town has also an extensive royal palace and many temples. The trade is of little importance. Population, about 12,000.

LUAPULA, lo͞o′ȧ-po͞o′lȧ. One of the main headstreams of the Congo, the other being the Lualaba, which joins the Luapula near the parallel of 7° south latitude. The Luapula, which is much longer than the Lualaba, may properly be regarded as the Upper Congo. It rises as the Chambesi in the mountains at the southern end of Lake Tanganyika, and after a long circuit enters and traverses Lake Moero, southwest of Tanganyika. During or after wet seasons the Chambesi also throws its waters into Lake Bangweolo, the southern part of which is, however, hardly more than a swamp, and at times even largely dry.

LUBAO, lo͞o-bä′ō. A town of Luzon, Philippines, in the Province of Pampanga, about 4 miles southwest of Bacolor. It is the centre of a rice, sugar, and indigo district. Population, 21,175.

LÜBBEN, lụb′ben, Heinrich August (1818-84). A German philologist, born at Hooksiel, and educated at Jena, Leipzig, and Berlin. He was instructor at Oldenburg (1844-75) and then librarian at the latter place. He devoted himself to the study of the Low German dialects and in 1875 became editor of the *Jahrbuch des Vereins für niederdeutsche Sprachforschung.* His works include: *Das Plattdeutsche in seiner jetzigen Stellung zum Hochdeutschen* (1846); and the important *Mittelniederdeutsches Wörterbuch,* with Karl Schiller (1871-81).

LUB′BOCK, Sir John, Lord Avebury (1834 —). An English naturalist, anthropologist, and publicist. He was born in London, the son of Sir John W. Lubbock, a banker, also noted as an astronomer and mathematician. He was educated at Eton, and then entered his father's banking house. He began early in his career to take part in public affairs, and in 1858 entered Parliament, where he served at intervals until elevated to the peerage as Lord Avebury in 1900. In politics he was of Conservative inclinations and became prominent in measures having to do with suffrage representation. He also soon became actively interested in antiquarian, scientific, and educational affairs. He was elected to the London County Council by the largest majority ever received by a candidate, and in 1890 succeeded Lord Rosebery as its president.

Although Lord Avebury will be remembered with good reason, and with gratitude, especially by the citizens of London and Oxford, as a man of affairs and a wise legislator, his fame is far wider and more permanent as a man of science, in which field he achieved eminence, especially in the departments of anthropology and entomology. His *Prehistoric Times, as Illustrated by Ancient Remains and the Manners and Customs of Modern Savages* (1865), formed a text-book on archæology for twenty years or more, and has not been superseded by any modern work; it has been translated into the chief languages of Europe. In order to interpret the results of explorations in drift gravels, caves, shell-heaps, lake dwellings, and earth-mounds, Sir John delivered at the Royal Institution of London in 1868 a course of lectures on the mental and social condition of savages, their languages, fine arts, marriage and kinships, laws, moral codes and practices, and religions. These lectures were published in a volume entitled *Origin of Civilization and the Primitive Condition of Man* (1870). The author took the human activities, especially those of a moral and social character, as his highest concepts, and traced each one in its origin, development, and varieties under different environments and among various primitive tribes.

A large share of his labors was devoted to experimental observation, to research, and to study in several departments of biology, notably in entomology. His first paper on an entomological topic to attract attention was published in the *Transactions* of the Royal Philosophical Society of London for 1857, on "The Ova and Pseudova of Insects." This was followed by various anatomical and embryological papers, the most notable being *Metamorphoses of a May-fly* (1863-65), in which he showed that the larva molts twenty-three times. In 1867 he published his discovery of that remarkable little myriapod-like animal, Pauropus, which probably turned his attention to the wingless insects now forming the groups Thysanura and Colembola, and in 1873 the Ray Society issued his chief systematic work, *A Monograph of the Colembola and Thysanura*. This work has now become antiquated, but was for a long while the standard authority on the subject of these insects, and there is no doubt that it did much to stimulate investigation of these hitherto neglected creatures. In 1873 he published in *Nature* a series of articles on the origin and metamorphoses of insects, and these articles were brought together in a volume (1873) which has always had a high place among the workers on the phylogeny of insects. He contended that the group Insecta is descended from some campodeiform ancestor, and showed that the larvæ of insects undergo an evolution more or less independent from that of the adult, being influenced by an entirely different environment and mode of life. In 1875 he published his charming book *British Wild Flowers Considered in Relation to Insects*, and in 1879 the Linnæan Society *Journal* began to publish the results of his experiments on some social insects, which were collected under the title *Ants, Bees, and Wasps* (1882), and became his most popular and best-known work; it shows a vast amount of close observation. His deductions have been disputed, notably by the German writer Bethe (see INSECTS, paragraph *Social Insects*); but his observations form records of great value.

In addition to the books above mentioned, Lord Avebury is the author of *Addresses, Political and Educational* (1879); *Fifty Years of Science* (1882); *Flowers, Fruits, and Leaves* (1886); *Senses, Instincts, and Intelligence of Animals* (1888); *Pleasures of Life* (1891); *Use of Life* (1894); *The Scenery of Switzerland and the Causes to Which It Is Due* (1896); *The Scenery of England*, etc. (1901), and many special papers.

LUBBOCK, Sir JOHN WILLIAM (1803-65). An English astronomer, born at Westminster. He received his education at Trinity College, Cambridge, where he graduated in 1825. He devoted himself to astronomical research, and contributed many papers to the *Proceedings* of the Royal Astronomical Society and Royal Society, of which he became member in 1828 and 1829, respectively. He aided in the establishment of the *British Almanac* (1827). His investigations on the tides were rewarded with a medal by the Royal Society in 1834. He gave a uniform method for the calculation of cometary and planetary orbits, and proved, in a more general way than Laplace, the stability of the solar system. He contributed also to the lunar theory and reduced the tabular errors of the moon. He applied the theory of probability to questions connected with life insurance. Besides his contributions to the *Philosophical Transactions*, his most important works are: *An Elementary Treatise on the Computation of Eclipses and Occultations* (1835); *On the Theory of the Moon and the Perturbations of the Planets* (1833-61); *Remarks on the Classification of the Different Branches of Human Knowledge* (1838); *An Elementary Treatise on the Tides* (1839).

LÜBECK, lụ'bĕk. A German principality, belonging to the Duchy of Oldenburg, bounded by Holstein, Lübeck Bay (an inlet of the Baltic), and the free State of Lübeck. Area, 330 square miles. It is a hilly region, well watered and wooded, and for the most part fertile. It has a council of eleven members, and is represented in the Landtag of Oldenburg. Population, in 1890, 34,718; in 1900, 37,340. Formally recognized as a Protestant bishopric by the Peace of Westphalia in 1648, Lübeck was secularized in 1803, and became a part of Oldenburg in 1823. Eutin, the seat of government of the principality, is an interesting old town of about 5000 inhabitants, and is known as the birthplace of Weber.

LÜBECK. One of the three city States of the German Empire (Map: Germany, D 2). It is composed of the free Hanseatic city of Lübeck, on the Trave, 40 miles by rail northeast of Hamburg; the territory lying between Prussia, the Baltic Sea, Mecklenburg, and Oldenburg; and nine enclaves in Holstein, Mecklenburg-Strelitz, Oldenburg, and Lauenburg. Total area, 115 square miles. The population of the State in 1900 was 96,775, chiefly Protestant, of whom 82,098 were in the city of Lübeck. The country is mainly a gently rolling plain, devoted to agriculture, and abundantly watered and provided with water transportation.

The city of Lübeck consists of the inner town, between the navigable Trave and the Wakenitz, and the three suburbs of Sankt Lorenz, Sankt Gertrud, and Sankt Jürgen. The inner town, with its towers, gates, and gabled houses, is still mediæval in appearance. It is especially noted for many fine examples of mediæval brick structures. The Church of Saint Mary (1280-1304) is one of the finest specimens of this kind of architecture. It has three naves and two towers about 410 feet high. Its interior is profusely decorated with paintings by old German masters, statuary, and wood-carving. Among these objects are valuable paintings by Borman and Overbeck, a fine Gothic ciborium, and some excellent stained glass. Noteworthy is the Briefkapelle or Chapel of Letters, which owes its name to written or printed prayers formerly sold here, with pictures of the saints. The cathedral, founded by Henry the Lion in 1173 and completed in the fourteenth century, is largely Gothic, although a part of the original Romanesque basilica is retained. It is an attractive edifice with a beautiful vestibule. Among the numerous objects of fine art which it contains may be mentioned an altar-piece by Memling—a triptych with several scores of figures. The Church of Saint Catharine is also worthy of mention. The most prominent of the secular buildings is the Rathaus (1250-1442), a very interesting Gothic brick building with gables and spires. Its northern façade is covered with portraits of German emperors, princes, and local dignitaries. The interior, restored in 1887-91, has a magnificent staircase and a number of imposing chambers with mural paintings and the arms of the Hansa towns. Especially interesting is its 'war chamber.' Other buildings attesting the ancient significance of the town are the house of the Schiffergesellschaft and the Chamber of Commerce.

Lübeck has numerous educational institutions, including the old Katharineum, now a gymnasium, a *realgymnasium* in the Minorite cloister, a private gymnasium, two *realschulen*, a school of navigation, a seminary for teachers, and a municipal theatre. The municipal library, founded in 1620, contains over 105,000 volumes (including 890 incunabula) and numerous MSS. and documents. The museum, built in 1889-92, possesses meritorious collections relating to the history of the town, as well as ethnographical, ecclesiastical, and art collections. The most noteworthy of the benevolent institutions is the Hospital zum Heiligen Geist, with an early Gothic chapel of the thirteenth century. Lübeck was never an important industrial city, and its manufacturing industries are still subordinate to its commerce. The chief manufactures are machinery, ironware, ships, chemicals, spirits, preserves, cigars, etc. The extensive commerce is mostly with Denmark, Sweden, and Russia. The harbor has been made accessible to heavy vessels by the canalization of the Trave. The rivalry of Hamburg, which, since the completion of the Kaiser Wilhelm Canal, had threatened the commercial existence of Lübeck, has been somewhat lessened in effect by the Elbe-Trave Canal, which was opened in 1900 between Lübeck and Lauenburg. The chief articles of commerce are timber, grain, coal and coke, iron, wire, and groceries. The total trade in 1900 amounted to over $147,000,000, of which $57,000,000 represented the value of the seaborne trade. The entrances and clearances at the port in 1899 were respectively 2862 vessels of 543,629 tons and 2872 vessels of 545,520 tons.

In its administration the city State of Lübeck does not differ much from Hamburg (q.v.). Its form of government, which was originally purely aristocratic, had gradually assumed a more representative character until the present democratic Constitution was finally adopted in 1875. The Senate, at present representing in a way the patrician council which controlled the city during the existence of the Hanseatic League, is composed of 14 Senators, among whom are to be included at least 8 members of the learned professions (6 lawyers) and 5 merchants. Vacancies in the Senate are filled by members chosen by a commission consisting of an equal number of Senators and members of the House of Burgesses. The Senate, presided over by a burgomaster elected for two years by the Senators from among themselves, is vested with the executive power, and shares the legislative power with the House of Burgesses. Any citizen of thirty years or over, and in full enjoyment of civil rights, is eligible for Senatorship. The House of Burgesses consists of 120 members elected by universal suffrage for six years. One-third of its members are renewed every two years. The functions of the House of Burgesses are purely legislative, and it has the right of initiative in matters relating to public expenditure, foreign relations, and general legislation. The sanction of both Houses is necessary for every new legislative measure. Lübeck is represented by one member in the Bundesrat and one member in the Reichstag. The judges of the lower courts are appointed by the Senate. The Hansa Supreme Court of Hamburg is the highest judicial authority of Lübeck.

The military affairs of the State are in the hands of Prussia. The budget was $1,480,000 in 1900-01, and the public debt about $7,700,000. The city owns the electric plant and the waterworks. Electric railways connect the inner town with the suburbs.

HISTORY. Lübeck was founded in 1143 by Count Adolphus III. of Holstein, from whom it passed in 1158 to Henry the Lion of Saxony. When the latter lost his territories in 1181, Lübeck became an Imperial city, with extensive privileges. Twenty years later the Danes seized the town, but held it a short time only. Frederick II. in 1226 declared Lübeck a free Imperial city, and in 1227 the Danes were defeated in the great battle of Bornköved. Meanwhile the city grew rapidly in population and wealth, and enjoyed many special trade privileges. It took a leading part in the foundation of the Hanseatic League and became its head. The Constitution of the city became a model for that of other free German towns. With the Reformation internal strife broke out in the city between the aristocratic party, which in the main was Catholic, and the democratic party, whose adherents had embraced the new faith. This soon undermined the prosperity of the city, and the Thirty Years' War inflicted disasters from which it never recovered. Its extensive trade fell chiefly into the hands of the Dutch and the English. During the Napoleonic era it repeatedly changed hands. Its independence was recognized by the Congress of Vienna in 1815. It joined in 1866 the North German Confederation, and became in 1870 one of the States of the new empire. Consult: Hoffmann, *Geschichte der Freien und Hansestadt Lübeck* (Lübeck, 1889-92); Pauli, *Lübeckische Zustände im Mittelalter* (Lübeck, 1847-72).

LÜBKE, lụp'ke, WILHELM (1826-93). A German art-historian, born at Dortmund. He studied at Bonn and Berlin; was professor of architecture at the Berlin Bauakademie (1857-61), and of the history of art at Zurich (1861-66), Stuttgart (1866-85), and Karlsruhe (1885-93). He wrote, in a comprehensive and readable style, numerous valuable works, including a *Geschichte der Architektur* (6th ed. 1855); *Grundriss der Kunstgeschichte* (1860, 12th ed. 1900; translated into English by Clarence Cook, 1880), and *Geschichte der Plastik* (3d ed. 1880), the last two of which have been much used as manuals.

LUBLIN, lyo͞o'blên. A government of Poland, Russia, bounded by Volhynia on the east and Galicia on the south and southwest. Area, 6503 square miles. The general appearance of the region is that of an elevated plateau, bordered and intersected by rivers. Thick forests cover the northern part, and marshes and lakes occur in the east. The region is watered by the Vistula, the San, the Wieprz, and the Bug. Agriculture is favored by the abundance of fertile soil as well as by the advantageous position of the government in regard to markets for the disposal of agricultural products. The German colonists and the larger landholders are more or less progressive in their agricultural methods, and even the native peasantry have been making some progress. Stock-raising is an important industry, and wool is exported; wooden articles form one of the chief products of the house industry. Spirits, beet-sugar, flour, leather, and trimmed lumber are the principal manufactures. The trade in grain and lumber is extensive, and passes to a large extent through the Vistula. Population, in 1897, 1,159,463, including over 716,000 Roman Catholics, about 232,000 Greek Orthodox, 167,000 Jews, and 31,000 Protestants. Capital, Lublin.

LUBLIN. The capital of the Government of Lublin, Russian Poland, situated on a small tributary of the Wieprz, 100 miles south-southeast of Warsaw (Map: Russia, B 4). It is a town of considerable antiquity, with a Roman Catholic church (Saint Nicholas's), dating from 986, a thirteenth-century cathedral, a number of old convents and monasteries, and a fine town hall. Its educational institutions include two gymnasia, a seminary for priests, and several theatres. Economically the town is of little importance, and its industrial activity is confined to the production of spirits, leather, agricultural implements, soap, candles, etc. Attached to the jail is a Government cloth-factory. Population, in 1897, 50,152, about 50 per cent. Jews and the rest Poles and Russians. Lublin rose into importance toward the close of the Middle Ages. It was the seat of several important diets, notably that of 1568-69, which decreed the union of Poland and Lithuania into a single commonwealth. In 1702 the town was taken and plundered by Charles XII. of Sweden.

LUBLINER, lōō-blē′nẽr, HUGO (1846—). A German dramatist, whose pseudonym is *Hugo Bürger*, born in Breslau. His plays include: *Der Frauenadvokat* (1873), his first great success; *Die Modelle des Sheridan* (1875); *Auf der Brautfahrt* (1880); *Mitbürger* (1884); *Die armen Reichen* (1886); *Der Reignitzer Bote* (1891); *Das neue Stück* (1894); *Der schuldige Teil* (1900); and *Die lieben Feinde* (1901).

LUBOWSKI, lōō-bŏv′skḗ, EDWARD (1839—). A Polish author, best known for his dramas and novels. He was born and educated at Cracow. His first success, *Nietoperze* (1875), a satiric comedy of manners, was followed by the character plays, *Przesady* (1876), *Pogodzeni z losem* (1878), *Sad honorowy* (1880), and *Jacuś* (1884). He also wrote many critical and historical essays. His later work includes the novels *Silni i slabi* (1865, under the pseudonym *Spiridion*), *Aktorka* (1869), *Na pochyłości* (1874), and *Krok dalėj* (1885).

LUBRICANTS (from Lat. *lubricare*, to make smooth, from *lubricus*, slippery). Substances applied to the friction surfaces of machinery to reduce the resistance of friction to motion. Lubrication is the process of applying lubricants. Lubricants may be either solid or liquid. The requisities of a good lubricant are: (1) 'Body' enough to prevent the surfaces to which it is applied coming in contact with each other; (2) freedom from corrosive acid, either of mineral or organic acid origin; (3) as great fluidity as possible consistent with 'body'; (4) a minimum coefficient of friction; (5) high 'flash' and burning points; and (6) freedom from all materials liable to produce oxidization or 'gumming.' Engineers have suitable tests for determining all of these properties of lubricants. Prof. R. H. Thurston states the best lubricants for different purposes to be: For low temperatures, such as rock-drills driven by compressed air, light mineral lubricating oils; for very great pressures, with slow speed, graphite, soapstone, and other solid lubricants; for heavy pressures, with slow speed, solid lubricants and lard, tallow, and other greases; for heavy pressures and high speed, sperm oil, castor oil, and heavy mineral oils; for light pressures and high speed, sperm, refined petroleum, olive, rape, and cottonseed oils; for ordinary machinery, lard oil, tallow oil, heavy mineral oils, and the heavier vegetable oils; for steam-cylinders, heavy mineral oils, lard, and tallow; for watches and other delicate mechanism, clarified sperm, neatsfoot, porpoise oil, olive oil, and light mineral lubricating oils; for mixture with mineral oils, sperm is best, lard oil is much used, olive oil and cottonseed oil are good. The preceding list gives a reasonably comprehensive résumé of the ordinary lubricants; special lubricating compositions sold under various trade names are combinations of these lubricants, and they may be either solid or fluid. Lubrication may be performed by manual application of the lubricant, or mechanical devices may be used for this purpose. These mechanical devices are called lubricators and they are made in a variety of forms and often are rather elaborate in character. In all cases they consist essentially of a reservoir for the lubricant from which one or a number of pipes lead to suitable discharge points at the different bearings, or rather friction surfaces. Consult: Kent, *Mechanical Engineers' Pocket Book* (New York, 1900); Thurston, *Treatise on Friction and Lost Work in Machinery and Mill Work* (New York, 1894). See OILS.

LUCA GIORDANO, lōō′kȧ jŏr-dä′nṓ. An Italian painter. See GIORDANO.

LUCAN, lū′kan, GEORGE CHARLES BINGHAM, Earl of (1800-88). An English soldier. After passing through Westminster School, he entered the army, and took part as a volunteer with the Russian forces in the Turkish campaign of 1828. He was elected a representative peer for Ireland in 1840, and served through the Crimean War as commander of a division of cavalry. He won for himself the rather unenviable distinction of being chiefly responsible for the blundering order that sent the Six Hundred upon their glorious but hopeless charge. He was made lieutenant-general in 1858, general in 1865, and field-marshal in 1887.

LUCAN (M. ANNÆUS LUCANUS) (A.D. 39-65). The chief Roman poet of the Silver Age. He was born at Corduba (the modern Cordova), in Spain, A.D. 39, and brought to Rome in his infancy by his father, who was a younger brother of the philosopher Seneca. He received an education of the best kind, was a school-fellow of Persius, and a friend of the Emperor Nero, and entered on life with the most brilliant prospects. He became quæstor and augur, and declaimed and recited in public with the highest applause. But he soon lost the favor of Nero, who was jealous of his poetry and his fame, and who desired to keep down both. Under the sting of this annoyance, he joined the conspiracy against Nero's life in A.D. 65. According to Tacitus, when arrested after the betrayal of the plot, he tried to save his life by accusing his mother of complicity. But the Emperor did not spare him for the sake of this additional crime; he was compelled to destroy himself by having his veins opened, and he died in this way, and with a certain ambitious composure, at twenty-six years of age. Lucan holds a conspicuous place among the poets of Rome. The only work of his that has come down to us is the *Pharsalia*, an epic, in ten books, on the civil war between Cæsar and Pompey. As an epic it is in parts disappointing; for it proceeds in the manner of annals, and lacks the comprehensiveness, unity, and learning of the greatest works of its class. Nor is its style, generally speaking, good, for it is often turgid and obscure. But when every deduction has been made, the *Pharsalia* affords ample proof that Lucan was a man of real and powerful genius. There is an eye for the sublime, both in the moral and physical world, constantly present in it; there is all the vigor of poetic oratory in its declamations; and there are felicities of epigram which have secured to many a line a constant freshness of life as part of the familiarly remembered literature of the world. Lucan was very popular in the Middle Ages, and in modern times his poem has been a particular favorite among the lovers of political freedom.

The first book of the *Pharsalia* was translated into English verse by Christopher Marlowe in 1593; and the whole poem was set in English verse by Rowe (London, 1718, with several later editions)—a translation which Dr. Johnson thought one of the best in the language. There is a literal English prose translation by Riley (London, 1853). The best editions of the *Pharsalia* are those of Haskins, with introduction and notes (London, 1887), and Hosius (Leipzig, 1892).

LUCA'NIA. In ancient geography, a district of Southern Italy, or Magna Græcia, extending from the Tyrrhenian Sea on the west to the Gulf of Tarentum on the east; bounded south by Bruttii, north by Apulia and Samnium, and northwest by Campania. With the exception of an extensive plain between the Apennines and the Gulf of Tarentum, the region is mountainous. It was one of the wildest parts of Italy, and sent from its mountain forests wild boars for the amphitheatres of Rome. The principal cities were Sybaris, Heraclea, Metapontum, and Thurium on the east coast; Pæstum (earlier Posidonia) and Elea or Velia on the coast of the Tyrrhenian Sea; Pandosia and Potentia, in the interior. The original inhabitants of Lucania were the Chones and the Œnotrians, who were gradually subdued by the Samnites, from the north, about B.C. 300. In B.C. 272 Lucania was subjected by the Romans.

LUCA'RIS, Cyril (c.1572-1638). A Greek theologian. He was born in Crete, probably in 1572, studied first at Venice, and afterwards at Padua, and subsequently visited Switzerland, where he formed intimate relations with the Protestant doctors, and carried back into Greece their spirit and their dogmas. Ordained a priest, he became Patriarch of Alexandria in 1602, and in 1621 Patriarch of Constantinople. He still cherished his Protestant opinions, and endeavored to promulgate them in the Church over which he ruled; but his conduct excited violent opposition among the clergy, and Lucaris was in consequence banished to Rhodes. Through the influence of the English Ambassador, however, he was soon reinstated. A confession of faith he had printed at Geneva in 1629, quite Protestant in its character, fell into the hands of his adversaries, and he was once more involved in difficulties. In 1636 he was banished to the isle of Tenedos, and, though recalled after a few months, in June, 1638, he was seized in Constantinople, hurried on board a vessel, and it was never positively ascertained what became of him. According to some, he was strangled in the ship which bore him off; according to others, he suffered this fate in a castle on the shores of the Black Sea. His doctrines have been repeatedly condemned by Greek synods. The *Codex Alexandrinus* was presented by him to Charles I. of England. Consult his *Life* by Pichler (Munich, 1862).

LUCAS, lụ'kȧ', Edouard (1842-91). A French mathematician, born at Amiens. He was educated at the Ecole Polytechnique and the Ecole Normale Supérieure in Paris. Upon leaving the latter he was made adjunct astronomer at the national observatory. He then became professor of mathematics at the lycées Charlemagne and Saint-Louis. His mathematical work was confined almost entirely to the theory of numbers, along the line followed by Fermat, although he also contributed somewhat to the theory of conics and to modern geometry. Besides a large number of memoirs in the *Nouvelles Annales*, *Comptes Rendus*, and other journals, he published the following works: *Application de l'arithmétique à la construction de l'armure des satins réguliers* (1867); *Recherches sur l'analyse indéterminée et l'arithmétique de Diophante* (1873); *Récreations mathématiques* (1881-94); *Théorie des nombres* (1891). He was also co-editor with Henry of the *Œuvres complètes de Fermat.*

LU'CAS, John Seymour (1849—). An English historical and portrait painter. He was born in London, December 21, 1849. He was a pupil at Saint Martin's School of Art, and in 1871 entered the Royal Academy, where a year later he exhibited his first picture, the "Apothecary" from *Romeo and Juliet*. He became associate of the Royal Academy in 1886. Among his best works are the "Burgomaster" (1877); "Armada in Sight" (1880); "Spy in Camp" (1882); "Whip for Van Tromp" (1883); "After Culloden" (1884), purchased by the Royal Academy; "Peter the Great at Deptford" (1886); "Eloped;" and the "Smoker." In 1898 he painted the fresco for the Royal Exchange representing "William the Conqueror Granting the First Charter to the City of London."

LUCAS DE BORGO, lōō'kȧs dȧ bŏr'gō. See Paccioli.

LUCAS VAN LEYDEN, vȧn lī'den (1494-1533). A Dutch painter, line-engraver, and designer for woodcuts. He was born at Leyden, the son of Huig Jacobsz, an engraver, from whom he received his first instruction. He also studied under Cornelis Engelbrechtsen in 1508, and at an early age was a celebrated engraver. When twenty-one years of age he married a rich wife of the Borchiuzen family in his native town, and then made his residence in Antwerp. In 1521 he was elected a member of the Guild of Saint Luke, and in 1527 he traveled luxuriously through Belgium in company with Jan Mabuse. He died in 1533, after a long illness.

His work is characterized by earnest realism, energy of expression, and extreme care in drawing, the details and accessories being finished with infinite pains; his color is luminous and warm in tone. His personages are honest and homely, with gestures frankly expressed; even his religious pictures are genre in character. His last works show Italian influence. As an engraver he stands preëminent for the skill shown in grouping figures and in expressing aërial perspective. There are two styles in his copperplate works; in one the lines are bold and broad, in the other they are fine and delicate.

Among his best paintings are the following: "Healing of the Blind Man," Saint Petersburg; "Saint Peter Martyr" (1508); "Last Judgment," Town Hall, Leyden; a "Card Party," Wilton House, England; "Virgin with Saints," Munich Gallery; "Sibyl Prophesying to Augustus" (water color), Vienna Academy. His best plates include: "Conversion of Saint Paul" (1509); "Ecce Homo" (1510); "Crucifixion" (1517); "Magdalen" (1519); "Esther and Ahasuerus;" "Return of the Prodigal Son;" "Abraham Dismissing Hagar." Consult: Rosenberg, in Dohme, *Kunst und Künstler Deutschlands*, vol. i. (Leipzig, 1877); Evrard, *Lucas de Leyde et Albert Durer* (Brussels, 1883); Volbehr, *Lucas, Verzeichnis seiner Kupferstiche* (Hamburg, 1888).

LUCAY, lụ'kȧ', CHARLES HÉLION MARIE, Count de (1831—). A French historian, born in Paris. In 1855 he was auditor of the Council of State, then Master of Requests under the Empire (1866), but retired to devote himself to history and agriculture. He was a member of the committee for historical works from 1875 and in 1891 was elected corresponding member for the Academy of moral and political science. He published: *Les assemblées provinciales sous Louis XVI. et les divisions administratives de 1789* (1857); *Les contributions de la France à cent ans de distance 1789-1889* (1891).

LUCBÁN, lo͞ok-băn'. A town of Luzon, Philippines, in the Province of Tayabas. It is situated in the heart of the mountain region in the western part of the province, about 8 miles northwest of Tayabas (Map: Luzon, H 10). The chief industry is the manufacture of straw hats and mats, and the town carries on a profitable trade with the neighboring provinces. Population, in 1899, 12,755.

LUCCA, lụk'kȧ. A famous and charming city of Italy, in the Province of Lucca, Tuscany, 15 miles northeast of Pisa (Map: Italy, E 4). It was formerly the capital of the Principality of Lucca. It is a mediæval, multi-colored town, situated in a productive plain, and surrounded by fortifications which form a popular place of promenade. The streets are narrow and crooked. The city is somewhat important in the history of mediæval architecture, as seen in its churches; and the sculptures of its citizen Civitali (q.v.) draw many connoisseurs. The celebrated Romanesque Cathedral of San Martino, erected in the latter part of the eleventh century, has been often restored and in the Gothic style. Its rich façade dates from 1204, and together with the highly ornamented vestibule is one of the chief attractions. Some of the reliefs are by Niccolò Pisano. The interior (91 yards in length) is also notable, with paintings by Ghirlandajo, and a beautiful Madonna by Fra Bartolommeo. It also contains a rare pulpit, a small marble chapel (il Tempietto) with sacred contents, shown thrice a year, and the 'Pisan Cross,' in silver, captured from the Pisans. Another fine church is the Basilica San Frediano, dating from early mediæval times, and possessing over twenty antique columns. It was restored in 1827. The façade is of the twelfth century. Among the contents are noteworthy paintings by Francesco Francia and Jacopo della Quercia.

The Palazzo Provinciale, formerly the ducal residence, was begun about 1580 and never finished. It is situated on the Piazza Napoleone and possesses a good picture gallery, with worthy examples of Giulio Romano and Fra Bartolommeo. There are several palaces of mediæval noble families. The city market stands on the interesting remains of a large Roman amphitheatre. Lucca has two academies of science, literature, and art, one of them founded at the close of the seventeenth century. Its four libraries possess rare MSS. and editions. The public library has over 125,000 volumes. Among the public monuments are a statue of Garibaldi and a bust of Mazzini. Owing to the thrift and industry of its inhabitants, the city has long been called Lucca l'industriosa. It is especially known for its silk manufactures. Velvets and other textiles are also produced, and there are foundries and glass and paper factories. The town has an active trade. Lucca is the seat of an archbishop. The environs are very attractive and abound in villas, the most prominent of which is the royal Villa di Marlia. To the south is a majestic aqueduct with some 450 arches. A few miles north is the famous Bagni-di-Lucca (q.v.). The population of Lucca (commune) in 1901 was 74,971.

HISTORY. Lucca first appears in history as an Etruscan town (Luca), which was taken B.C. 177 by the Romans and made a colony. After the fall of Rome it passed into the hands successively of the Ostrogoths, Lombards, and Franks. Before the rise of Florence it was the principal city in Tuscany. Weakened by the long feuds between the Ghibellines and the Guelphs within the city, Lucca came in 1314 into the possession of Uguccione della Faggiuola, the ruler of Pisa. In 1327 the celebrated Castruccio Castracani became Duke of Lucca. Subsequently the city changed hands repeatedly, but in 1370 it regained its independence. For more than two centuries its government was democratic, but ultimately the power passed into the hands of an oligarchy. In 1799 it was taken by the French, and in 1805 was bestowed by Napoleon on his sister, Princess Bacciochi. By the Congress of Vienna it was given to the Spanish infanta, Maria Louisa, the former Queen of Etruria, and her son, Charles Louis. In 1847 the duchy was united to Tuscany, and together with that principality became in 1860 a part of united Italy. Consult: *Memorie e documenti per servire all' istoria dello stato e città di Lucca* (14 vols., Lucca, 1813-60); Del-Carlo, *Storia popolare di Lucca* (2 vols., Lucca, 1877).

LUCCA, lụk'kȧ, PAULINE (1841—). A German dramatic soprano, born in Vienna. She was a pupil of Uschmann and Lewy, but was too poor to continue her studies and so joined the chorus of the Vienna Court opera. In 1859 she made her début at Olmütz as Elvira in *Ernani*. She then sang for a while in Prague, and in 1861, having attracted the attention of Meyerbeer, obtained an engagement at Berlin, where her success was absolute for years. In 1863 she made her first appearance in England, to which country, as well as to France and Russia, she made many subsequent visits. In 1872 she came to the United States, where she became a great favorite. Meyerbeer and Auber considered her unequaled, and the latter was so struck by her interpretation of the part of Zerlina in *Fra Diavolo* that he gave her the pen with which he had written the opera. Her most famous rôles include Selika (*l'Africaine*), Carmen, Elsa, Marguerite, and La Sonnambula.

LUCCHESINI, lṳk'kȧ-zē'nē, GIROLAMO, Marchese (1752-1825). A Prussian diplomat, born at Lucca. In 1778 he went to Berlin, was introduced by Abbé Fontana to Frederick II. of Prussia, and was made his librarian. In 1790 he was sent to Warsaw, where in spite of strong opposition he concluded a treaty between Poland and Prussia, and in 1802 he was sent to Paris as plenipotentiary and advocated a Franco-Prussian alliance. In 1806, on the outbreak of war, he left Paris, and was a peace commissioner after the battle of Jena, but, the King not approving the terms he had made, he retired to Lucca in 1807.

LUCE, lṳs, AUGUSTE SIMÉON (1833-92). A French historian, born at Bretteville-sur-Ay, Manche, and educated at the Ecole des Chartes (1856-58), where he studied law. He was made archivist of the Department of Deux-Sèvres (1858), and was head of the historical department in the national archives from 1866. In 1882 he was made a member of the Academy of Inscriptions and Belles-lettres, professor of the sources of French history at the Ecole des Chartes the same year, and in 1883 received the Legion of Honor cross. He prepared an edition of Froissart's chronicles (1866-88); one of the *Chronique du Mont-Saint-Michel* (1879-86), and published also *De Gaidone Poemate Gallico Vetustiore Disquisitio Critica* (1860); *Chronique des quatre premiers Valois* (1862); *Histoire de Bertrand Duguesclin et de son époque* (1876, 2d ed. 1883); *Jeanne d'Arc à Domrémy* (1886); and *La France pendant la guerre de Cent Ans* (1890).

LUCE, STEPHEN BLEECKER (1827—). An American naval officer, born in Albany, N. Y. He entered the United States Navy in 1841, was commissioned lieutenant in 1855, and in 1862 as lieutenant-commander aided in the blockade of South Carolina ports, participating in the battles of Hatteras Inlet and Port Royal. In 1872 he became captain, in 1881 commodore, and in 1885 rear-admiral. From 1884 to 1886 he was president of the United States Naval War College, of which he was a founder, and in 1889 he was retired. In 1892 he represented the United States as commissioner-general at the Columbian celebration held at Madrid to commemorate the four hundredth anniversary of the discovery of America. He published *Seamanship* (1868), which was used as a text-book at the Naval Academy, and edited *The Patriotic and Naval Songster* (1883).

LUCENA, lo͞o-thā'nȧ. A city in the Province of Cordova, Spain, 36 miles southeast of the city of that name, and picturesquely situated between two hills (Map: Spain, C 4). The neighboring territory is famous for its breed of horses and its production of wine; the city has manufactures of textiles, bronze, and earthenware. Population, in 1887, 21,271; in 1900, 21,294.

LUCERA, lo͞o-chā'rȧ (Lat. *Luceria*). A town of Southern Italy, in the Province of Foggia, situated on an eminence 10 miles west-northwest of Foggia (Map: Italy, K 6). It has a lyceum, a technical school, a cathedral, a splendid episcopal palace, and well-preserved remains of a castle built by Emperor Frederick II. A large trade in silk is carried on by the inhabitants. Population (commune), in 1901, 17,515. Numerous inscriptions and fragments of ancient sculpture have been found here.

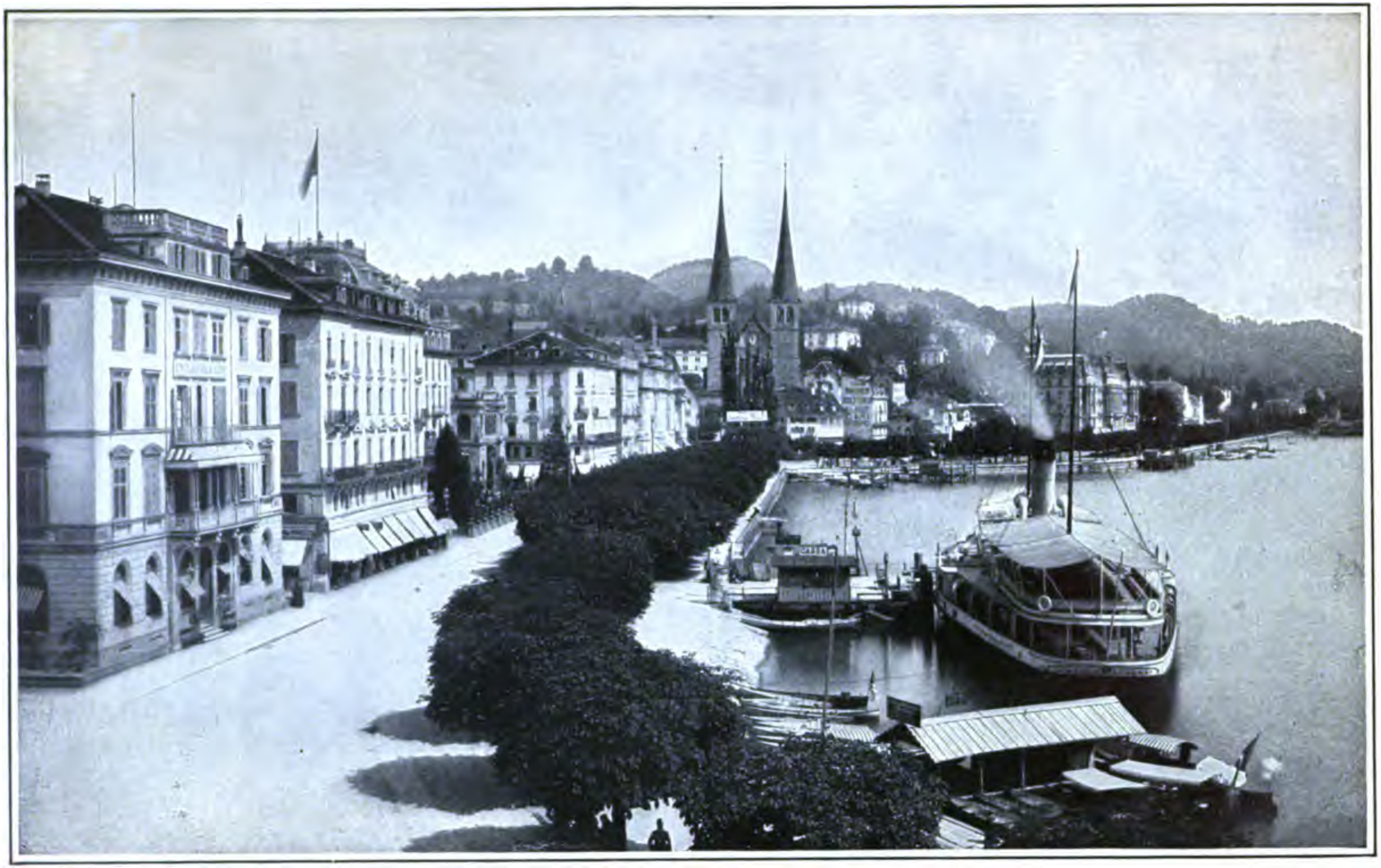
LU'CERES. One of the three patrician tribes of ancient Rome.

LU'CERNE. A leguminous fodder plant. See ALFALFA.

LUCERNE, lo͞o-sẽrn', *Fr. pron.* lṳ'sȧrn'. A canton of North Central Switzerland, bounded by the Canton of Aargau on the north, Zug and Unterwalden on the east, and Bern on the south and west. Its area is 579 square miles. The southern part belongs to the great Alpine highland, two spurs of which, the Lucerne Alps, inclose the Entlebuch Valley, through which the Little Emme flows into the Reuss after the latter issues from the Lake of Lucerne (q.v.) in the eastern part of the canton. Northward the land slopes into the Gäu Valley, watered by the Wigger, the Suhr, and other tributaries of the Aar. Here also are the two lakes of Baldegg and Sempach. The great northern valley is essentially an agricultural country, and about four-fifths of the whole canton consists of arable or pasture land. Grain, potatoes, flax, hemp, and fruit are produced; it is one of the foremost stock-raising cantons, especially for cows and goats. Large quantities of milk are yielded, of which about 60 per cent. is used in the manufacture of cheese and condensed milk. Straw-braiding is carried on largely as a house industry, and there are some textile, metal, paper, and tobacco manufactures, especially in the neighborhood of the city of Lucerne. By the cantonal Constitution of 1875, but slightly revised since, there is a Legislature of 55 members elected by the people for four years, and an executive of seven members elected by the Legislature for the same period. The initiative and referendum are in force, and a popular vote can be called by the demand of 5000 citizens. The canton sends seven members to the National Council. Education is well provided for in primary and secondary schools, a pro-gymnasium, a normal school, and large public libraries. The population, in 1888, was 135,360, and in 1900, 146,159. Practically all are German-speaking. The great majority are Roman Catholics.

The history of the canton is largely bound up with that of the city of Lucerne (q.v.). It was the fourth to join the Swiss Confederation, which it did in 1332. During the fourteenth and fifteenth centuries it increased its territory by purchase and by conquest. Its government was largely an oligarchy in the hands of a few families until the French invasion of 1798, when democratic institutions were established.

LUCERNE



THE SCHWEIZERHOF QUAY AND HOFKIRCHE

LUCERNE, lo͞o-sĕrn′, *Fr. pron.* lụ′sârn′. The capital of the Canton of Lucerne, Switzerland, situated on the Reuss, where it issues from the northwest extremity of the Lake of Lucerne (Map: Switzerland, C 1). Its location in an amphitheatre of mountains, including the Rigi and Pilatus, and its mediæval towers and walls, make it one of the most interesting and picturesque towns in Switzerland. It is favored besides by a mild climate. Lucerne is divided by the river into two parts, connected by five bridges, of which two are covered, mediæval structures painted with scenes from the lives of the patron saints of Lucerne and with a "Dance of Death." Broad quays lined with rows of chestnut-trees stretch along the northern lake shore where the new town lies, with broad streets and squares lighted by electricity. The Quai National and the Schweizerhof Quay are splendid promenades, affording justly celebrated views of the neighboring peaks and the green sweep of the lake. The older portion of the city extends along the southern bank of the river, and is built after the mediæval fashion, with crooked, narrow thoroughfares and old-fashioned houses. Of the churches the finest is the 'Hofkirche,' with two slender towers erected in 1506. Its organ is famous for the purity of its tones. The town hall dates from the seventeenth century, and contains an antiquarian and an art collection. Its stained glass is noteworthy. The most noted memorial the town possesses is the famous "Dying Lion of Lucerne," carved out of the side of a grotto from a model by Thorwaldsen, to commemorate the defense of the Tuileries in Paris, August 10, 1792, by the Swiss Guards, who were massacred by the infuriated mob. The lion is nearly thirty feet in length. The adjacent Glacier Garden is also a unique attraction. Among the educational institutions are the new cantonal school, equipped with extensive geological and botanical collections, and various secondary, technical, industrial, and commercial schools. There are also a musical conservatory; the museum containing the cantonal library (90,000 volumes); the municipal library, rich in books of Helvetian history; the cantonal natural history collection; the museum of stuffed Alpine animals; and the panoramas of Lucerne history and scenery. A fine building was dedicated in 1902 as the International Museum of War and Peace.

Lucerne derives its water-supply through an aqueduct from the springs of Mount Pilatus, 14 miles away. There is an extensive system of electric railroads in the city. Several railroad lines centre in the town. Despite these facilities, however, Lucerne has but little trade, and manufactures only small quantities of silk and ironware. The chief business of the inhabitants is the accommodation of tourists, who throng here yearly to the number of over 100,000, and for whom there are nearly seventy hotels. The environs are famous for their beauty and historic interest. (See LUCERNE, LAKE OF.) Population, in 1888, 20,314; in 1900 (commune), 29,255, mostly Roman Catholic.

Lucerne appears as a town as early as the eleventh century. It belonged to the House of Hapsburg until 1332, when it entered the Federation, its citizens taking part in the battle of Sempach in 1386. The Reformation was not well received in Lucerne. In fact, the city led the Catholic forces during the religious wars. In 1798 Lucerne became the capital of the Helvetic Republic. In 1844 it placed itself at the head of the Sonderbund, but capitulated in 1847 and was occupied by the federal troops. Since that year its history has been tranquil. Consult Heer, *Guide to Lucerne* (Lucerne, 1899).

LUCERNE, LAKE OF (Ger. *Vierwaldstätter See*, 'Lake of the Four Forest Cantons'). A beautiful lake of Switzerland, and one of the most famous lakes in Europe. It is situated in the north-central part of the country, bordering on the cantons of Schwyz, Uri, Unterwalden, and Lucerne (Map: Switzerland, C 1). It has roughly the shape of a cross with irregular and winding arms. The altitude is 1435 feet; the greatest depth 700 feet. The length of the main body, from the town of Lucerne in the northwest to Flüelen in the southeast, is 23 miles. The average width is 1½ to 2 miles, but in several places it is reduced to a half of a mile or less by outjutting promontories which divide the lake into several basins. Of these basins the principal are the Bay of Lucerne, forming the upper end of the cross, those of Alpnach and Küssnacht, forming the two cross-arms, and the Weggiser See, the Buochser See, and the Lake of Uri, forming the divisions of the main body.

Each of these divisions is almost entirely shut off from the others so far as the view is concerned, and each has its own characteristic appearance. The scenery in the lower (northern) part of the lake is strikingly picturesque as viewed from a steamer at the centre of the cross (the *Kreuzrichter*). On one side towers the gloomy peak of Mount Pilatus, while on the other is the bright, garden-covered mountain of Rigi, far-famed for its unsurpassed view. Between them is seen the steep, forest-covered slope of the Bürgenstock. The water in this part of the lake is a clear blue. The water assumes a deep green hue in the Lake of Uri, which is surrounded by steep, rocky cliffs. Through the rifts in these cliffs can be viewed the snow-clad peaks and glaciers in the distance. The lake is subject to sudden and dangerous winds. The shores of the Lake of Uri are associated with the mythical history of William Tell. On its banks, also, in a spot called Grütli (q.v.), men from Uri, Unterwalden, and Schwyz pledged themselves in 1307 to drive out their foreign oppressors, and thus paved the way for Swiss liberty. Along the eastern shore runs the Axenstrasse, celebrated as one of the most beautiful roads in existence. Its construction in the solid rock is a marvel of engineering skill. The principal affluent is the Reuss, which enters at Flüelen and leaves the lake at Lucerne.

LUCHAIRE, lụ′shâr′, ACHILLE (1846—). A French historian, born in Paris. He was educated at the Superior Normal School (1866-69), taught in the lyceums at Pau and Bordeaux, and received the degree of Doctor of Letters (1877) for his two theses, *De Lingua Aquĭtanica* and *Alain le Grand, sire d'Albret*. The same year he was appointed to the chair of history at Bordeaux and in 1885 became professor at the Sorbonne. Four years afterwards he succeeded to the chair of mediæval history. His publications include: *Noms de lieux du pays basque* (1874); *Recueil de textes de l'ancien dialecte gascon*, with a glossary (1881); *Histoire*

des institutions monarchiques de la France sous les premiers Capétiens, 987-1180 (2 vols., 1884); *Louis VI., le Gros: annales de sa vie et de son règne* (1889); *Les communes françaises à l'époque des Capétiens directs* (1890); and *Manuel des institutions françaises: Période des Capétiens directs* (1892).

LUCHU. See LOO-CHOO.

LUCIA DI LAMMERMOOR, lōō-chē'ȧ dē lăm'mẽr-mōōr'. An opera in three acts by Donizetti (Naples, 1835), with words by Salvatore Cammarano. The plot is borrowed with modification of the action from Scott's *Bride of Lammermoor.* A French version was produced in Paris in 1839 and an English version in London in 1843.

LUCIAN, lu'shan (Gk. *Λουκιανός*, *Loukianos*, L. *Lucianus*) (c.120-c.200 A.D.). The most brilliant representative of the revived Greek literature under the Roman Empire, and one of the world's greatest wits. He was born about the year A.D. 120 at Samosata, the capital of the Syrian District of Commagene. Except for a casual denunciatory paragraph in Suidas, his biography must be reconstructed from his writings. In the charming little piece entitled "The Dream," he tells us how his parents, being poor, apprenticed him to his maternal uncle, who was a sculptor. One of his first careless strokes spoiled a fine slab of marble, whereupon his uncle proceeded to cudgel him, and the lad ran home weeping to his sympathetic mother. That night he saw in a dream two beautiful women contending for him—education (literary culture) and handicraft (for as such he esteemed the art of Phidias). Culture prevailed, and Lucian tells the story to one of the audiences of his successful prime, that poor boys may be encouraged by his example to aim at the highest. Rhetoric was the surest passport to all forms of distinction for a young provincial in the Roman Empire of the second century. The young Syrian or Cappadocian who mastered the Greek language and acquired the faculty of fluent and pleasing discourse was no longer a barbarian, but a Greek and a member of an intellectual aristocracy that made him at home in Tarsus or Massilia, in Ephesus, Alexandria, or Athens. And he had his choice of the two most honorable and lucrative professions of the day, that of the advocate, and that of the 'sophist' or professor of rhetoric. Such was Lucian's life till about the age of forty. Of his practice at the bar of Antioch, to which Suidas alludes, he tells us nothing. But we catch glimpses of him as a popular lecturer and declaimer in Asia Minor, Greece, Macedonia, Italy, and Gaul. A few of his extant writings, by their trifling or purely formal character, would be classified as 'sophistic' and presumably of this period. Such are the declamations on the Tyrannicides, on Phalaris, on "The Disinherited Son," the amusing encomium on the fly, the "Case of Sigma *vs.* Tau," and the "Lawsuit of the Vowels." Other little pieces scattered through his works read like graceful introductions to more formal literary displays. Such may have been the "Dream," the "Herodotus," and the highly wrought descriptions of Zeuxis Hippocentaur, or of the house in which the speaker was entertained in Macedonia.

It was inevitable that Lucian should outgrow this trifling. It pleased him to represent the change as a conversion to philosophy, and in the "Nigrinus," a Platonic philosopher of that name (perhaps invented by Lucian), eloquently contrasts the life of unsatisfying and restless luxury led by the great at Rome with the philosophical peace and calm attainable at Athens. In the "Twice Accused" Rhetoric first brings suit against him for abandoning her, his lawful spouse. She had found him a little Syrian barbarian knocking about Ionia and had made him a Greek gentleman and a prosperous man; and now he basely deserts her for Dialogus (philosophy). On the other hand, Dialogus complains that Lucian has dragged him down from high discourse about immortality in the Academy to employ him upon vulgar and trivial themes, and has impaired the purity of his native Platonic speech by Aristophanic jests and Menippean satire.

The dialogues thus aptly characterized by Lucian constitute the best known and largest part of his extant work. There are twenty-six little *Dialogues of the Gods*, the humor of which consists in gravely accepting as facts the most grotesque anthropomorphic tales of the mythology, and deducing the consequences with Swiftian verisimilitude. Of a like character are the fifteen dialogues of marine deities. The *Dialogues of the Dead* dwell with fierce and painful insistence on the impartial democracy of the grave, and the revelation that it brings of the nothingness of human life. In similar vein are the longer "Charon" and "Menippus." The *Dialogues of Courtesans* portray one of the darker sides of ancient life, largely in literary reminiscences from the new comedy. To the *Dialogues of the Gods* must be added the "Zeus Confuted," in which a cynic philosopher challenges Zeus to reconcile his own supremacy with the Homeric doctrine of fate; and the very amusing "Zeus in Tragics." In other cases the dialogue is the vehicle of satire on contemporary life—especially the pretensions and weaknesses of the philosophers and the superstitions of the multitude. Such are the "Day Dreams," the "Lie-Monger," the "Fishers," the "Sale of Lives" or auction of the Philosophies in the persons of their traditional representatives, the "Symposium" or "Banquet of Philosophers," which degenerates into a Donnybrook fair. Sometimes the dialogue form is abandoned for that of the essay, the biography real or fictitious, the narrative epistle to a friend, or the novelette. "How to Write History" combines many sensible precepts with entertaining satire. The "Demonax" is a biography of Lucian's ideal philosopher—perhaps invented by him. The letter on the death of Peregrinus describes the self-cremation at Olympia of a typical figure of the age, half religious mystic, half charlatan, for whom Lucian felt no sympathy in either character. The "Alexander," or "False Prophet," portrays the notable career of the impostor Alexander of Abonoteichos, who barely missed founding a new religion. There is a good account of it in Froude's *Short Studies.* The *True History* is a parody of the romances of the day, and itself the ancestor of Rabelaisian romance. *The Ass* is a tale of Thessalian enchantments and adventures substantially identical with that of Apuleius's *Golden Ass.*

One of the most famous of Lucian's essays describes the petty miseries of the educated Greek who entered the service of one of the great Roman families as tutor. Toward the close of his life he himself accepted a lucrative post in the Roman administration of Egypt. A charming apology explains the inconsistency, or rather explains that there is none.

Of Lucian as a literary artist there can be but one opinion. He is one of the world's greatest writers of prose. His Greek syntax will not bear the microscope of the professional grammarian, but for literary purposes he writes correct enough Attic. And his command of the resources of what was to him a dead language is amazing. He has every word and phrase of Plato, Aristophanes, and Demosthenes at his pen's end, and for purposes of literary allusion is master of all Greek literature and history. But he uses this scholarship as an artist and not as a pedant. He describes and narrates with incomparable vividness and vivacity, and his ingenuity, fancy, fertility of invention, and inexhaustible variety in vocabulary, allusion, and turn of idiomatic phrase never allow the attention to flag. Estimates of Lucian as a man and a thinker will depend on the philosophy of the critic. Lucian's temper is essentially negative and destructive. We may plead that he was a satirist and that, with the exception of Christianity, which it was impossible for him to estimate, he mocked only at folly or superstition. We may add that his denials imply a very strong positive belief in common sense, common honesty, good taste, and the great tradition of Greek art and literature. But to most readers this will seem a very small residuum of positive faith and enthusiasm among so many negations. Especially will Lucian be suspect to all those who take metaphysics seriously, or who, with Bacon, had rather believe all the fables of the Talmud than risk rejecting the kernel with the shell. The religion at which he mocked was either the outworn Hellenic mythology or the degrading Oriental superstitions which were competing for its place. The philosophers whom he satirized were unworthy successors of Plato and Zeno. But the Hermotimus (well paraphrased in an interesting chapter of Pater's *Marius*) shows that his skepticism went deeper, and that he had systematically closed his mind against all attempts of either philosophy or religion to transcend the world of sense and common sense. Renan praises him as the one man who in an age when even Marcus Aurelius coquetted with superstition remained unaffected by the taint. We may go further and say that there is no other example of a great writer (in contradistinction to a mere thinker) so utterly undisturbed by any visitings of vague yearnings, misgivings, sudden touches, thoughts beyond the reaches of our souls. There is a certain hardness, his warmest admirers must admit, in the brilliance of Lucian. He lacks the natural, human touch.

Bibliography. Lucian is generally read in the convenient three-volume Teubner text, edited by Jacobitz, who also edited the chief annotated edition (Leipzig, 1836-41). The *Selected Translations* by Emily James Smith (Harpers) are eminently readable. Professor Gildersleeve, in *Essays and Studies*, devotes a witty and entertaining chapter to Lucian; while Croiset's *Essai sur la vie et les œuvres de Lucien* (Paris, 1882) contains the fullest and best exposition and criticism.

LUCIAN, Saint (?-312). A presbyter of Antioch. He was born at Samosata in the third century. Entering the ministry at Antioch, he founded and conducted a theological school. He became greatly celebrated as an ecclesiastic and biblical scholar. In the reign of Diocletian, by order of Maximin, he was arrested in Antioch, transported to Nicomedia, and tortured to death in prison, January 7, 312. He appears to have made a recension of the text of the Bible, which was much used in Greece and Asia Minor. Jerome speaks of him as also the author of several epistles and theological tracts. There has been dispute respecting his views of the Trinity, and it is a fact that Arius and the other founders of Arianism were his pupils, and that he lived apart from the Church during the episcopates of three successive bishops of Antioch. After his death he was enrolled in the calendar of the Church as a saint and martyr. His creed is given in Hefele, *History of the Councils* (Eng. trans., vol. i., Edinburgh, 1871 sqq.).

LUCIANI, lōō-chä'nê, Sebastiano. See Sebastiano del Piombo.

LUCID INTERVAL (Lat. *lucidus*, bright, from *lucere*, to shine). The true definition of lucid interval, according to the alienist, is: A period of time, of from an hour's to a few days' duration, during which an insane person appears sane in speech and act, and in general manner and conduct. The forms of insanity in which a lucid interval occurs are generally characterized by exaltation or perversion. There may thus be a cessation or suspension of the fury in mania; there cannot be repair or enlightenment of the obscurity in idiocy or dementia. It may consist in the mere substitution of clearness and calmness for violence and confusion; in the occasional recognition of his actual condition and external relations by the lunatic; or in the reëstablishment of intelligence and natural feeling so perfect and complete as to differ from sanity solely in the want of permanence. There invariably exists an under-current of unsoundness. It is found to be extremely difficult to distinguish this state from real and trustworthy restoration to reason, except by reference to duration. Legally, these conditions have been held to be identical. A will executed during a lucid interval, although that was extremely transitory, and although the testatrix unloosed the straps by which her hands had been confined, in order to execute the document, has been held to be valid; all that appears to be required, under such circumstances, is to prove that the conduct of the individual bore the aspect of rationality and health. It has been observed that, immediately before death, a small proportion of the insane regain lucidity, and die in possession of comparative sense and serenity. This change is supposed by some to depend upon the failing powers of the circulation. Consult: Shelford, *A Practical Treatise on the Law Concerning Lunatics, Idiots, and Persons of Unsound Mind* (London, 1833); Taylor, *The Principles and Practice of Medical Jurisprudence* (London, 1873); Reese, *Medical Jurisprudence and Toxicology* (Philadelphia, 1902); Spitzka, *Manual of Insanity* (New York, 1887); Hamilton, *A Manual of Medical Jurisprudence* (New York, 1887). See Insanity.

LU'CIFER (?-371). Bishop of Cagliari, in Sardinia, and a zealous opponent of Arianism.

He was born in Sardinia. In 354 he was sent by Liberius, Bishop of Rome, with Eusebius of Vercelli, to defend Athanasius at the Council of Milan, for which he was for a time imprisoned, and then banished by the Arian Emperor Constantius, and lived mostly at Eleutheropolis, in Syria, where he composed his chief work, *Ad Constantium Augustum pro Sancto Athanasio.* In consequence of his bold and vehement invective he was sent to Egypt. Released from exile on the death of Constantius, 361, he was commissioned by the Council of Alexandria to heal the divisions in the Church of Antioch, which had arisen from the dissensions between the Arians and the Orthodox. But he widened the schism by ordaining Paulinus to the see, for which he was rebuked by his friends. Chafing under the rebuke and displeased with the decree of the Council of Alexandria readmitting the adherents of Arianism, he retired in 363 to his native island of Sardinia and founded a small and short-lived sect called Luciferians, whose distinguishing tenet was that no Arian should be received into the Church. He died in Sardinia, 371. His works are in Migne, *Patrol. Lat.*, xiii.

LUCIFER (Lat., light-bearer), or PHOSPHORUS. The morning star. Hesiod makes Phosphorus son of Eos, the dawn, and Astræus; others call his father Cephalos. He is the favorite of Aphrodite, with whom he vies in beauty, and of whose temple he has charge. When the identity of the morning and evening star was recognized, Phosphorus and Hesperus were made brothers, and represented in art much like the Dioscuri. In the translation of a verse of Isaiah (xiv. 12) the word is used with reference to the glory of the King of Babylon. The passage runs in the Authorized Version as follows: "How art thou fallen from heaven, O Lucifer, son of the morning! How art thou cut down to the ground, which didst weaken the nations!" This was later understood to be the fall of Satan from heaven, and thus the word Lucifer has come to be used to denote the fallen archangel, as by Milton and many others.

LUCILE, lū-sēl′. A narrative poem by Lord Lytton (Owen Meredith), published in 1860. Practically a French novel with the personages altered, but the diction and many of the incidents taken from the *Lavinia* of George Sand, it was a clever metrical experiment in English anapæstic rhymed couplets which won remarkable success and popularity. The tale could have been told as well in prose, and the poet afterwards regretted its publication as being at variance with his riper experience of the attributes of poetry.

LUCIL′IUS, GAIUS (B.C. 148-103). A Roman poet, born at Suessa Aurunca (Sessa), in the northwestern part of Campania, Italy. He was of the equestrian order, and the maternal granduncle of Pompey the Great. In his sixteenth year he served under Scipio Africanus at the siege of Numantia. He is generally considered the originator of Latin satirical composition, at least of that form adopted by Horace, Persius, and Juvenal. His satires were popular in the Augustan Age, and to him Horace, Juvenal, and Persius seem to have been indebted for their best thoughts and expressions, as satirists. His style was distinguished by great energy of expression, but deficient in elegance and clearness. He attacked vice with great severity. He was on intimate terms with Lælius and Scipio. His works consist of thirty satires, a comedy, epodes, and hymns, none of which are extant except 800 fragments of his satires, the longest of which has only thirteen verses. These have been collected and published by R. and H. Stephens in their *Fragmenta Poetarum Veterum Latinorum;* by Müller (Leipzig, 1872), and by Baehrens (Leipzig, 1886). Consult: Müller, *Leben und Werke des Gaius Lucilius* (Leipzig, 1876); and Patin, *Etudes sur la poésie latine* (Paris, 1883, vol. ii., pp. 366-400).

LUCI′NA (Lat., she who pertains to light). In Roman mythology, the surname of Juno as the goddess of light, and especially as the deity who presided over the birth of children. This function of Juno Lucina became so prominent that the surname came to have the same meaning as Εἰλείθυια, (*Eileithyia*) in Greek. At the birth of a child a payment was made at her temple, and women sacrificed to her after a safe delivery.

LUCIUS, lū′shĭ-ŭs. The name of three popes. LUCIUS I. Pope probably from June 25, 253, to March 5, 254. That he was banished for a time is evident from a letter of Cyprian in congratulation upon his release from exile. The assertion that he died a martyr's death cannot be proved. From Cyprian it appears that he was in favor of the restoration to the Church of the lapsed who fell away from the faith under heathen persecution. Consult Lipsius, *Chronologie der römischen Bischöfe bis zur Mitte des vierten Jahrhunderts* (Kiel, 1869).

LUCIUS II. Pope 1144-45, Gherard da Caccianamichi. He first appears prominently in 1124-30 as cardinal-presbyter of Santa Croce and legate of Honorius II. to Germany. In 1130 he became a partisan of Innocent II., who at Honorius's death was elected Pope, against the Antipope Anacletus II. He was rewarded by appointment as librarian and chancellor of the Holy See. He succeeded Celestine II. as Pope, but proved unequal to the difficulties resultant from the confused state of affairs at Rome. A revolt broke out, Giordano Pierleone, its leader, was chosen *patricius*, and a new Senate was elected (*Renovatio sacri senatus*). Lucius was asked to relinquish his exalted rights and privileges, and content himself with the tithes and oblations of a bishop of the primitive Church. He refused, vainly sought aid from the Emperor Conrad III., and finally enlisted the Frangipani, enemies of Pierleone, in his behalf, but died before the decision of the contest.

LUCIUS III. Pope 1181-85, Ubaldo Allucingoli. During his pontificate the struggle was continued for the great estates bequeathed by the Countess Matilda of Tuscany to the Holy See (1115) and contested by the Emperor Frederick Barbarossa. Lucius replied to an offer of compromise from the Emperor by demanding the immediate surrender of the estates. This Frederick, with the existence of the Empire in Central Italy at stake, refused. A conference held at Verona in October, 1184, resulted in no solution. Frederick, however, acceded to the Pope's request to begin preparations for a crusade to rescue Palestine from Saladin. Lucius was expelled from Rome through insurrection, and although he obtained money from England to maintain warfare against his opponents, afterwards resided mainly at Verona.

LUCIVEE, lōō'sĭ-vē'. A name in New England and Quebec, corrupted from the French *loup cervier* ('deer wolf'), for the wild cat of that region—the Canadian lynx. See LYNX.

LÜCKE, lụ'ke, GOTTFRIED CHRISTIAN FRIEDRICH (1791-1855). A German commentator. He was born at Egeln, in the Duchy of Magdeburg; studied theology at Halle and at Göttingen. In 1818 he was made ordinary professor of theology at Bonn, and devoted himself with enthusiasm to the study of exegesis and Church history. In 1827 he became professor of theology at Göttingen, and died there February 14, 1855. His chief work was a commentary on the writings of Saint John (partly translated, Edinburgh, 1837). His library is now at Harvard.

LUCKENWALDE, lụk'en-väl'de. A town of the Province of Brandenburg, Prussia, situated on the river Nuthe, 30 miles south-southwest of Berlin (Map: Prussia, E 2). It has important cloth and hat factories, machine-shops, iron-foundries, and a considerable trade in beer and lumber. Population, in 1890, 18,398; in 1900, 20,986.

LUCKNER, lụk'nĕr, NIKOLAUS, Count (1722-94). A French soldier, born at Cham, Bavaria. He entered the Bavarian Army, then that of Holland, and, in command of a corps of Hanoverian hussars, distinguished himself in the Seven Years' War. In 1763 he joined the French Army with the rank of lieutenant-general. In 1791 he was made a marshal, and in 1792 took command of the national troops in the north of France. He soon was replaced by Kellermann, and was reprimanded by the Convention for his inadequate success. In January of the next year he was guillotined.

LUCKNOW, lŭk'nou. The capital of Oudh, British India, on the right bank of the Gumti, 42 miles northeast of Cawnpore, and 675 miles northwest of Calcutta by rail (Map: India, D 3). The river here, spanned by three bridges, one of iron, is navigable for several miles above the town, and below to the Ganges. The city is 360 feet above the sea. From a distance it has an imposing appearance, with its domes, minarets, and pinnacles, but the impression is diminished on a nearer inspection by the squalor of its numerous narrow streets and the mean dwellings of the poorer natives. The chief public buildings are the Juma Musjid or great mosque, the Kaiser Bagh, Chattar Manzil and Farhat Baksh palaces, and the royal mausolea, including the Imambara, built by Asafudaulah within the Machchi Bhawan or great fort, the latter noted for its splendid western entrance, the Rumi Darwazah or Constantinople Gate. Considerable improvements were effected in the sanitary conditions during the latter half of the nineteenth century, and the city took control of the waterworks. Among the educational institutions is a college for half-caste children, situated in the Martinière, a pretentious building erected by Claude Martin, a French private soldier who rose to power and wealth under the British and native governments. The Canning College, founded in 1864, and affiliated to the University of Allahabad, has five departments; there are also an observatory, an interesting museum, hospital, and dispensary, and various European mission churches and schools. The manufacture of muslins, lace, gold and silver brocade, shawls, and velvets is carried on; large railway workshops have been established here, and Lucknow has an extensive trade in grain, raw cotton, timber, iron, and the general products of the province. Although Lucknow is conspicuous by an absence of antiquities, it is understood to be older than any other of the great Indian cities, and is said to have been founded by Lakshmana, brother of Rama. From 1775 it was the capital of the Kingdom of Oudh until the annexation by the British. During the mutiny of 1857 Lucknow surpassed every other station in the energy and obstinacy of the defense by the British garrison against the insurgents. Intrenched in the Residency, now one of the show places of the city, for twelve weeks 1700 men held out against a besieging force of over 10,000, until reënforced in September by new troops under Generals Havelock and Outram. The siege, however, was not raised, but continued until Sir Colin Campbell reached the city two months later and enabled the garrison to withdraw. The city was regained by the British in March of the following year. Population, in 1891, 273,028; in 1901, 264,049. Consult Innes, *Lucknow and Oude in the Mutiny* (London, 1895).

LUCK OF EDEN HALL, THE. A tenth-century Venetian drinking-glass, preserved in the Musgrave family at Eden Hall, Cumberland, England. The legend relates that it was stolen from the fairies and that the fortunes of the house are closely bound up with it. Under the title Longfellow translated Uhland's ballad (1834) "Das Glück von Edenhall."

LUCKY GOWAN, gou'*a*n, or LUCKEN GOWAN. See GLOBE-FLOWER.

LUCRECE, lû-krēs', THE RAPE OF. A poem by Shakespeare, based on the story of the wife of L. Tarquinius Collatinus. It was printed in 1594 with a dedication to the Earl of Southampton.

LUCRETIA, lû-krē'shĭ-ȧ. The most famous heroine in early Roman story. She was the wife of L. Tarquinius Collatinus (of Collatia), a member of a collateral branch of the Tarquinian royal family. When the Roman Army was besieging Ardea, the young nobles in their camp fell into a discussion regarding the character of their wives, and resolved, in a lull in the hostilities, to ride back and come upon them by surprise. At Rome they found the King's daughters feasting and making merry; then they hastened to Collatia, where Lucretia was spinning among her slaves. Thereupon they returned to the camp; but the infamous Sextus Tarquinius, one of the King's sons, fired by an ignoble passion, returned secretly to Collatia, and in the dead of night entered Lucretia's room and forced her, under a horrible threat, to comply with his desires. But no sooner had he left than Lucretia aroused the household, summoned her husband and father, and related what had happened. Then, making them swear to avenge her, she stabbed herself and died. When the facts were known the indignant people arose against the Tarquins, whom they expelled from the city, and established the Republican Government (c.509 B.C.). See BRUTUS, LUCIUS JUNIUS.

LUCRETIA; or, THE CHILDREN OF THE NIGHT. A novel by Bulwer (1846). It is the story of Thomas Wainwright, a noted poisoner, who appears in the character of Varney.

LUCRETIA GENS (Lat., Lucretian family). One of the oldest gentes of Rome, originally patrician and subsequently plebeian as well. The patrician surname was Triciptinus; the plebeian families bore the surnames Gallus, Ofella, and Vespillo. The cognomen of the poet Lucretius was Carus.

LUCRETIUS (Titus Lucretius Carus) (c.99-c.55 B.C.). A Roman poet of the first rank. Of the details of his life practically nothing is known. An entry in the chronicle of Saint Jerome, under the year B.C. 94, records "the birth of the poet Lucretius, who lost his reason through a love-philtre. After composing in the intervals of his madness several books which Cicero subsequently edited, he died by his own hand in his forty-fourth year." But Donatus, in his life of Vergil, says that Lucretius died in 55; and this date is rendered probable by the fact that the first mention of his poem occurs in a letter of Cicero to his brother, written February, 54. The dates 99-55 may thus be accepted as approximately correct. De Quincey, in his essay on Keats, expresses his admiration for Lucretius as "the first of demoniacs," and holds that "the characteristic manner of his poem, even if all anecdotes had perished, would have led an observing reader to suspect some unsoundness in his brain." And it is, indeed, generally agreed that the *De Rerum Natura* shows such unrelieved intensity of thought and feeling, coupled at times with such sombreness, as to make quite credible the tale of madness and suicide, though not necessarily for the cause assigned. On the other hand, the masses of varied and disparate facts are logically arranged, the reasoning, whether inductive or deductive, is clear and consecutive, and the entire poem (of about 7500 lines) shows marked symmetry of design and execution. The composition of so extensive a work *per intervalla insaniæ* seems most unlikely. It is certain, however, that, as Lachmann first proved, the poet did not live to put the final touches to his work. Of many paragraphs there are double drafts, many arguments are not adjusted to their context, and the workmanship is in many details rough and inartistic. The lack of finish is especially noticeable in the later books. It is evidently impossible to determine exactly to what extent the posthumous editor is responsible for the existing text.

The *De Rerum Natura*, the single poem into which Lucretius poured the passion of his life, is an attempt to vindicate for man his independence of thought and action by proving the soundness and adequacy of the Epicurean philosophy. Once make clear the true nature of the gods, that their 'happy, careless lives' are in no way concerned with the government of the universe, for the reason that everything happens in accordance with fixed laws of nature and not by divine intervention; once make clear, also, the true nature of the soul, that it, like everything else, is composed of atoms, and is therefore subject to the universal law of birth and death—man, set free from the fear of the gods both here and hereafter, absolute master of his fate in this, the only world that he is to know, has it in his power to live a life of noble simplicity. The proof that man is thus 'lord of himself' depends ultimately upon the atomic theory as formulated originally by Leucippus and Democritus, and later modified by Epicurus. The demonstration of scientific facts and principles is, therefore, of vital importance, and the greater part of the poem is inevitably devoted to discussions for which prose would have been a more natural medium. But the poet's towering enthusiasm and remarkable power over language have forced into the hexameter verse elements seemingly unmanageable.

The poem is divided into six books. In Book I. he states as the basis of his system the two propositions that out of nothing nothing can be created by divine power, and that no existing thing can be reduced to nothing, but only to its ultimate elements. The ultimate elements of the universe are two, void and atoms. The latter are infinitesimally small, indivisible, and indestructible. They are, further, infinite in number, as void or space is infinite in extent. Thus the universe has no centre, as the Stoics thought. Book II. deals with the motions of the atoms, the diversity of their shapes, and their modes of combination. In the discussion of their motions, the famous theory of the *clinamen*, or 'swerve' from the straight parallel lines naturally followed by bodies falling in space, is introduced to account for their initial contact; and upon this power, inherent in the atom, is based the freedom of the human will. The atoms differ in size, weight, and shape only, and have no secondary qualities. Sensation in living beings is a function of certain special atomic combinations. As space and matter are infinite, the whole universe is filled with systems like our own. In Book III. Lucretius presents a long series of arguments to prove that the soul is composed of very minute and mobile atoms, and is so intimately associated with the body that each is vitally affected by the other and neither can survive separation. The closing 260 lines of this book, in which the right attitude toward death is passionately urged, is perhaps the noblest passage in Latin literature. The fourth book is a continuation of the third, and explains the widespread belief in the continued existence of the souls of the dead in connection with the theory of sense-perception in general. The adaptation of the senses to their functions, however, does not justify the inference of design. The action of the mind during sleep is explained, and the book concludes with a vivid picture of the disastrous results of indulging the passion of love. Book V., to the modern mind in many ways the most remarkable in the poem, ascribes the formation of our system (which, composed of perishable parts, will some day cease to exist), not to creative intelligence, but to countless chance combinations of atoms. After the emergence of the earth, sea, sky, sun, and moon from the confused mass, animal as well as vegetable life was produced directly from the earth; but many of these forms of animal life were unable to defend themselves, and so became extinct. The condition of primitive man is described, and then his gradual advance in civilization, the origin of language, discovery of fire, beginnings of civil society, of religion, and of the arts, use of the metals, weaving, agriculture, and music. Everything in the constitution of the world and in the life of man is thus shown to be due to natural causes, not to divine activity. With the same purpose in view, Book VI. is devoted to those natural phenomena that are usually ascribed to the agency of the gods, especially thunder and lightning, earthquakes, volcanic eruptions, the rising of the Nile, and the power of the magnet. The discussion of the spread of disease leads to an impressive account of the plague at Athens, based upon that of Thucydides, and with this the book and the poem abruptly end.

The permanent value of the work of Lucretius is not due to its scientific discussions, though it is to these that the greater part of the poem is devoted. It is true that the atomic theory of Democritus and Epicurus (Lucretius did not himself make any contribution) has proved to be the most fruitful of all ancient physical theories, and that many of the general principles enunciated in the first two books of the poem are in striking accord with modern science; true, also, that the brilliant outline of anthropology given in the fifth book still seems essentially correct. But in countless details he is wrong, even absurdly wrong. Scientific method was as yet little understood; and Lucretius, in this respect, was not in advance of his time. He possesses, however, in high degree the scientific temper and the scientific imagination. No thinker has more firmly grasped the universality of law, none takes greater delight in the discovery of facts and the determination of their meaning and connection. Almost alone among the Romans, he has an inborn taste and capacity for philosophical speculation, and his mind moves through the intricacies of a subtle argument with a sureness that rouses one's admiration.

Neither is the special merit of Lucretius to be found in his literary art, although the *De Rerum Natura* is a splendid monument of pure and virile Latinity. He was evidently a wide reader both in Greek and in Latin, and well versed in the traditions of the poet's craft. The diction and rhythm of Ennius, in particular, had a great attractiveness for him, and the poem of Empedocles *On Nature* probably determined the form of his own. While he himself avowedly regards his poetry as merely a help to the effective exposition of his philosophy, the numerous digressions, in which he has expressed his deepest musings on human life, as well as countless touches in the scientific portion proper, all reveal poetical powers of the highest order. The cadence of the hexameter lacks, of course, the music and variety that Vergil was to put into it. The verse is sometimes monotonous, but more often its ruggedness and majesty harmonize admirably with the thought.

Lucretius was an earnest seeker for the truth, but it was in the spirit of the typical Roman, for a definite practical end, the emancipation of mankind from the bondage of superstition. Against the anthropomorphic deities of popular religion, arbitrary and vengeful, he wages war with a fervor, or rather fury, that is almost startling. Epicureanism seems to him 'a healing gospel,' and he its preacher. But the seriousness and exaltation of his nature makes of it really a new philosophy. Life has too solemn a meaning to be spent in the quest of pleasure, however refined. Fortitude and renunciation are its true watchwords. The enduring interest of the poem is thus a psychological one, and is due to the unconscious self-portrayal of one of the noblest minds in history.

The *editio princeps* was published at Brescia in 1473. The most important of the early editions are the first Aldine (1500), edited by Avancius, the Giunta (1512), by Candidus, and those of Lambinus (Paris, 1563; 3d ed. 1570). But all modern editions are based on that of Lachmann (Berlin, 1850; 4th ed. of the text, 1871; of the commentary, 1882). The text was edited for Teubner by Bernays (Leipzig, 1852), and by Brieger (Leipzig, 1894; 2d ed. 1899). The most helpful editions to-day are those of H. A. J. Munro (3 vols., text, commentary, translation; 4th ed. London, 1886) and C. Giussani (2 vols., text and commentary, with good introductory essays; Turin, 1896-97). The following works will be found of special value: Sellar, *The Roman Poets of the Republic* (Oxford, 1881); Martha, *Le poème de Lucrèce* (Paris, 1873); Zeller, *Stoics, Epicureans, and Sceptics*, trans. by Reichel (London, 1880); Lange, *History of Materialism*, trans. by Thomas (Boston, 1881); Masson, *The Atomic Theory of Lucretius* (London, 1884); Wallace, *Epicureanism* (London, 1880). See, also, Tennyson's poem *Lucretius*, and W. H. Mallock, *Lucretius on Life and Death.*

LUCREZIA FLORIANI, lo͞o-krā′tsê-ȧ flō′rè-ä′nê. A partially autobiographic novel by George Sand (1847).

LUCRINO, lo͞o-krē′nô, LAKE (also Lake Lucrine; ancient *Lacus Lucrinus*). A small salt-water lake in Italy, 10 miles west of Naples and separated from the Gulf of Pozzuoli by a narrow dam of sand. In ancient times it was famous for oysters, and they are now cultivated there. In the time of Augustus, Agrippa connected Lake Lucrinus with Lake Avernus (q.v.) and with the bay of Cumæ (*Sinus Cumanus*), thus forming the Julian Harbor (Portus Julius), celebrated by Horace and Vergil. The canals and wharves were entirely destroyed in 1538 by the volcanic upheaval of Monte Nuovo that half-filled up Lake Lucrino.

LUCUL′LUS, GARDENS OF (Lat. *Horti Lucultiani*). Famous pleasure grounds on the slope of the Pincian Hill at Rome, laid out with lavish expense by Lucullus, and completed by Valerius Asiaticus. They contained porticoes and libraries, a banqueting-hall, and a palace which afterwards became the favorite residence of Messalina. Of these buildings only a few pieces of wall and some mosaic pavement under neighboring streets remain. The famous Scythian sharpening his knife, now in the Tribune of the Uffizzi, and the head of Ulysses in the Vatican were found on the site of the gardens.

LUCULLUS, LUCIUS LICINIUS (c.110-c.57 B.C.). A distinguished Roman general. In the first Mithridatic War he commanded the fleet as legate of Sulla. In B.C. 77 he filled the office of prætor, and immediately after held the administration of the Province of Africa. In B.C. 74 he was chosen consul along with Marcus Aurelius Cotta, and received Cilicia for his province, while Cotta had Bithynia. Both consuls arrived in Asia about the close of B.C. 74. Cotta was soon after utterly defeated by Mithridates, who had burst into Bithynia at the head of 150,000 troops, was forced to take refuge in Chalcedon, and was besieged by the victor. Lucullus, however, advanced to his relief at the head of 35,000 men, compelled Mithridates to raise the siege, and almost annihilated his army on its retreat. In B.C. 71 Pontus became subject to the Romans. The measures which Lucullus now introduced in the government of the Province of Asia, to secure the provincials against the fearful oppressions and extortions of farmers of the taxes and usurers, especially his fixing a uniform and moderate rate of interest for all arrears, show that he was a just, wise, and humane administrator; but though the cities of Asia were grateful for his clemency, the equestrian order in Rome (who had the farming of the taxes) became implacably hostile to him, and his own troops grew disaffected on account of the strictness of his discipline. In the spring of B.C. 69 he marched into Armenia with a small force of 12,000 foot and 3000 horse, and gained a complete victory over Tigranes, at the head of an army of 220,000 men. In the following year he gained another great victory at the river Arsanias over a new army led against him by Tigranes and Mithridates; but the mutinous spirit of the legions—in spite of these splendid triumphs—daily increased. Lucullus now wanted to besiege Artaxata, the capital of Armenia, but the soldiers refused to advance farther. After this he could do nothing; not a soldier would serve under him. At last he was superseded by Pompey, and left Asia B.C. 66. The cabals of his enemies so much prevailed against him that he was three years in Rome before he obtained his triumph. In conjunction with the aristocratic party, he attempted to check the increasing power of Pompey, and the attempt caused the coalition known as the first triumvirate. But he was ill fitted to act as leader against such unscrupulous men, and soon withdrew altogether from political affairs. During his public career he had acquired (but not unfairly) prodigious wealth; and he spent the remainder of his life surrounded by artists, poets, and philosophers, and exhibiting in his villas at Tusculum and Neapolis, and in his house and gardens at Rome, a luxury and splendor which became proverbial. Toward the close of his life his faculties began to decay, and his property was placed under the management of his brother. He died about B.C. 57.

LUCY, Henry W. (1845—). An English journalist. He was born at Crosby, studied at the Crescent School and in Paris, and in 1864 joined the staff of the *Shrewsbury Chronicle.* In 1870 he went to London and joined the staff of the *Pall Mall Gazette,* and in 1886 became chief editor of the *Daily News.* He became known as the contributor, over the signature 'Toby, M.P.,' of the amusing and oft-quoted "Essence of Parliament," the *Punch* department originated by Shirley Brooks, and also wrote a London letter to several provincial papers. His publications include: *Man and Manners in Parliament* (1875); *Gideon Fleyce,* a novel (1882); and *Mr. Gladstone: A Study from Life* (1896).

LUCY, Sir Thomas (1532-1600). An English knight known in connection with Shakespeare. On the death of his father (1552) he succeeded to the estate of Charlecote, about four miles from Stratford-on-Avon; rebuilt the manor house; was knighted by Elizabeth (1565); became high sheriff of Worcestershire (1586), where his wife held property; was justice of the peace for Warwickshire; and sat in two Parliaments (1571 and 1584). According to tradition, which is perhaps in part true, Shakespeare stole deer from Lucy's park (about 1585), and as a result found it convenient to leave Stratford. With little doubt Shakespeare took Lucy as his model for Justice Shallow. Consult *Henry IV.,* part ii., *The Merry Wives of Windsor,* and Sidney Lee, *William Shakespeare* (London, 1899).

LUD'DITES (said to be named from Ned Lud, an imbecile who in a fit of rage broke two stocking-frames). The name first assumed in 1811 by bands of English workmen organized for the destruction of machinery

The risings were due in part to a general industrial depression, and in part to the want of employment caused by the displacement of hand-labor through the introduction of machinery. At Nottingham the Luddites first made their appearance. From Nottingham, between the autumn of 1811 and the summer of 1812, the riots spread to the counties of Derby and Leicester, and to Cheshire, Lancashire, and Yorkshire. They were met by the enactment of harsh penal laws. It was made a capital crime to destroy any sort of machinery used in factories, and in 1812 seventeen men were hanged together in York. Owing to the failure of the harvests and to the economic depression following the close of the Napoleonic wars, in 1816 the riots broke out again on a much larger scale, and eventually spread over nearly the whole Kingdom. Consult: Peel, *The Risings of the Luddites, Chartists, and Plug-Drawers* (2d ed., London, 1888); Pellew, *Life of Henry Addington, Viscount Sidmouth,* vol. iii. (London, 1847).

LÜDEMANN, lṳ'de-mȧn, Hermann (1842—). A German Protestant theologian, born at Kiel (Prussia). After study (1861-67) at Kiel, Heidelberg, and Berlin, he was appointed a lecturer at the first-named university in 1872, and a professor of New Testament exegesis in 1878. In 1884 he became professor of Church history at Bern, where later he received appointment to the chair of systematic theology and the history of philosophy in the theological faculty. His position became in general that of the Jena school, critical and liberal in both instruction and publications, which latter include: *Die Anthropologie des Apostel Paulus* (1872); *Die Eidbrüchigkeit unserer neukirchlichen Geistlichen* (1881; 3d ed. 1884); and *Die neuere Entwicklung der protestantischen Theologie* (1884).

LUDEN, lōō'den, Heinrich (1778-1847). A German historian. He was born in Loxstedt; was educated at Göttingen, and from 1806 till his death was professor of history at Jena. His writings include: the *Allgemeine Geschichte der Völker und Staaten des Altertums* (1814); *Allgemeine Geschichte der Völker und Staaten des Mittelalters* (1821-22); and *Die Geschichte des deutschen Volks* (12 vols., 1825-37), his most important work.

LÜDENSCHEID, lṳ'den-shīt. An industrial town of Prussia, in Westphalia, in a mountainous district, 33 miles northeast of Cologne (Map: Prussia B 3). It manufactures cutlery, articles of German silver and other alloys, and musical instruments. Its iron-foundries, machine-shops, and cotton-mills also give employment to many workers. Population, in 1890, 19,457; in 1900, 25,520.

LÜDERITZ, lṳ'dĕr-ĭts, Franz Adolf Eduard (1834-86). A German merchant and founder of the first German colony in Southwest Africa. He was born in Bremen, where his father was a tobacco merchant; traveled in America from 1854 till 1859, and after his father's death in 1878 succeeded to the management of the business. In 1881 he established a factory at Lagos, and in 1883 he acquired Angra Pequeña, which the next year was placed under German protection. He was drowned in the Orange River in October, 1886.

LÜDERS, lụ'dẽrs, ALEXANDER NIKOLAYEVITCH, Count (1790-1874). A Russian general, born in the Government of Podolia. He entered the army when he was a boy, and for fifty years (1805-56) served actively, participating in a hundred battles. He particularly distinguished himself in 1812, in 1831 at the capture of Warsaw, in the Caucasus (1844), at the defeat of the Hungarians near Schässburg (1849), and in the Crimean War. Appointed Governor of Poland in 1861, he was recalled after a year of severe rule, and was honored by the Czar with the title of Count.

LUD'GATE. A former gate in the western part of the ancient wall of London, so called because it was once supposed to have been built by the British King Lud. The name is preserved in the thoroughfare called Ludgate Hill, in Ludgate Circus, and in the former debtors' prison, removed in the latter part of the eighteenth century.

LUDHIANA, lo͞od'hē-ä'nȧ. The capital of a district of the same name in the Jalandhar division, Punjab, British India, on the North Western Railway, 71 miles northwest of Ambala (Map: India, C 2). It stands on a navigable nullah or stream, which joins the Sutlej from the east about 15 miles below the town. It has a considerable grain trade, and is noted for its manufactures of chudders or shawls of soft Rampur wool, its pashmina cloths, turbans, and scarfs, furniture, and carriages. Its chief features are the fort, the shrine of Abdul Kadir-i-Jalani, the Anglican church, the American Presbyterian mission, established since 1840, and the public gardens. The town was founded in 1480 by two princes of the House of Lodi. Over 30,000 of the inhabitants are Mohammedans. Population, in 1891, 46,334; in 1901, 48,649.

LUD'INGTON. A city and the county-seat of Mason County, Mich., on Lake Michigan, 105 miles northwest of Grand Rapids, and the terminus of the Pere Marquette Railroad (Map: Michigan, G 5). It has regular communication by steamer with Chicago, Milwaukee, and other lake ports, and through freight connection by railroad ferry with Manitowoc, Wis., 61 miles across the lake. The manufacture of lumber is the principal industry; but there are also extensive game-board factories, and a large trade in grain, fruit, and salt. The city is a beautiful summer resort, situated at the mouth of the Marquette River and in a lake region well known for its fishing, and has the grounds and cottage of the Epworth League training assembly, and a clubhouse and park. The water-works are owned by the municipality. Population, in 1890, 7517; in 1900, 7166.

LUDLOW, lŭd'lō. A municipal borough in Shropshire, England, at the confluence of the Corve and Teme, 25 miles south-southeast of Shrewsbury (Map: England, D 4). It is an old and very interesting town, and was once a royal residence, surrounded by walls, one of the seven gates of which still exists. The castle, a magnificent ruin, was one of the most important strongholds against the Welsh. Here Arthur, eldest son of Henry VII., celebrated his marriage with Catharine of Aragon, afterwards the wife of Henry VIII.; here, in 1634, Milton's mask of *Comus* was performed for the first time, and here Butler wrote *Hudibras.* It succumbed to sieges by King Stephen, the Lancastrians, and the Parliamentarians, and was dismantled in 1689. Ludlow has a very old parish church, and its grammar school, founded in 1282, is the oldest in the Kingdom. The town owns markets, a corn exchange, and water-works. Population, in 1891, 4460; in 1901, 4552. Consult: Clive, *History of Ludlow* (London, 1841); Wright, *History of Ludlow* (London, 1851).

LUDLOW, EDMUND (c.1617-1692). An English Parliamentarian and regicide. He was born at Maiden-Bradley, Wiltshire; was educated at Oxford; joined the Parliamentary army under Essex as a volunteer, and was at the battle of Edgehill in 1642. After the death of his father he entered Parliament for Wiltshire, and obtained command of a regiment of cavalry. He was an ardent republican, denounced the government of the King, advocated the establishment of a Commonwealth, and supported the bill for the abolition of the House of Lords. He was one of the judges of Charles I. His independence rendered him obnoxious to Cromwell, who sent him after the death of Charles to Ireland in 1650 with a military command. When Cromwell assumed the authority of Protector, Ludlow protested against it, being in favor of a republic. Returning to England, he refused unqualified submission to Cromwell. Distrusted on account of this refusal, he was required to give security that he would not oppose the Government, which being privately furnished by his brother Thomas, Ludlow retired into Essex, where he resided till Cromwell died. He then returned, was active in Parliament, and endeavored to restore the Commonwealth. On the restoration of Charles II., feeling himself insecure, he fled the country in 1660, landed at Dieppe, and then went to Switzerland, taking up his residence at Vevey. Wearied with exile, after the advent of William III., he returned to England in 1689, but, being threatened with arrest for participating in the execution of Charles I., he again fled to Vevey, where he died. Over the doorway of his house he had placed the inscription, *Omne solum forti patria quia patris.* Here he wrote and published his historically valuable *Memoirs* in 3 vols. (1698-99; new edition by Firth, London, 1894).

LUDLOW, FITZ HUGH (1836-70). An American author, born in Poughkeepsie, N. Y. He entered upon the life of an author when twenty years old, and one year later (1857) published *The Hasheesh Eater*, which achieved immediate popularity. He next became known as a sketch and story writer, contributing freely to *Harper's Monthly* and other leading magazines; and, having made a Western tour, gave an account of his experiences in a work entitled *The Heart of the Continent* (1870). He also wrote *The Opium Habit* (1868), designed to be a warning.

LUDLOW, JAMES MEEKER (1841—). An American clergyman, born in Elizabeth, N. J. He graduated at Princeton in 1861, and at the Theological Seminary there in 1864; was pastor of the First Presbyterian Church, Albany, from 1865 to 1869; of the Forty-eighth Street Collegiate

Reformed (Dutch) Church, New York, from 1869 to 1877; of the Westminster Church, Brooklyn, from 1877 to 1886, and subsequently of the First Presbyterian Church, East Orange, N. J. Among his publications are: *My Saint John* (1883); *Concentric Chart of History* (1885); *The Captain of the Janizaries* (1886); *A King of Tyre* (1891); *That Angelic Woman* (1893); *The Age of the Crusades* (1896); *Deborah* (1901); and *Incentives for Life* (1902).

LUDLOW, Roger (c.1590-c.1665). An English colonial lawyer and administrator in America. He was born at Dinton, Baycliffe, Wiltshire; was educated at Balliol College, Oxford, and afterwards studied law. He went to New England in 1630, and became one of the first settlers of Dorchester, Mass. For four years thereafter he was a member of the Board of Assistants for Massachusetts Bay, part of the time representing the colony as agent in London, and in 1634 was chosen Deputy Governor. In 1635 he was defeated by John Haynes (q.v.) for Governor of the colony, and the pique at this defeat and dissatisfaction with his surroundings led him in the following year to join, with a company of his Dorchester neighbors, the migration led by Thomas Hooker (q.v.) into the lower Connecticut valley. He settled at Windsor, was one of the first commission of government, in January, 1639, was a member of the convention at Hartford called to formulate a constitution for the Connecticut towns, and is believed to have drafted the famous document known as the 'Fundamental Orders.' In the following April he was elected Deputy Governor of Connecticut. In August he accompanied Capt. John Mason (q.v.) in his second expedition against the Pequots. On the election of Haynes, who had also removed from Massachusetts to Connecticut, to the office of Governor, Ludlow, who called him his 'evil genius,' left Windsor and founded the town of Fairfield, but continued as Deputy Governor. From 1643 to 1645 he was a commissioner in the Congress of the United Colonies of New England. In 1646 he was appointed by the General Court to codify the laws of Connecticut. His codification (published at Cambridge, Mass., in 1672) was officially adopted in 1650, and was long known as 'Mr. Ludlow's Code.' It won for him the title of the 'Father of Connecticut Jurisprudence.' In 1654, after being censured by the General Court at New Haven for influencing Fairfield to make an unauthorized attack upon the Manhadoes, he left the colony in disgust for Virginia. In 1656 he was in England, and appears to have settled in Ireland, but nothing further is known of him. Consult: Johnston, *The Genesis of a New England State* (Baltimore, 1883), "Johns Hopkins University Studies," No. 11; and Johnston, *Connecticut* (Boston, 1887), in the "American Commonwealths Series."

LUDLOW, William (1843-1901). An American soldier, born at Islip, Long Island, N. Y. He graduated at West Point in 1864, was commissioned a first lieutenant of engineers, and served under General Hooker in the Atlanta campaign as chief engineer of the Twentieth Army Corps, Army of the Cumberland. He was assistant engineer to General Sherman's army during the famous 'march to the sea' and the subsequent operations in the Carolinas, and earned the brevets of major and lieutenant-colonel. From 1872 to 1876 he was chief engineer of the Department of Dakota; was promoted to be major in June, 1882; was chief engineer of the Philadelphia water department, by special permission of the Government granted in a resolution of Congress, from 1883 to 1886; and from 1886 to 1888 was engineer-commissioner of the District of Columbia. He had charge of the river, harbor, and lighthouse work on the Great Lakes from 1888 to 1893. From 1893 to 1896 he was military attaché to the United States Embassy at London. He was promoted to be lieutenant-colonel of engineers in August, 1895; was president of the United States Nicaragua Canal Commission in the same year, and in 1897-98 had charge of the river and harbor work at New York City. In May, 1898, on the outbreak of the Spanish-American War, he was appointed brigadier-general of volunteers. He distinguished himself in the Santiago campaign, was promoted to be major-general of volunteers in September, 1898, was president for a time of the board appointed to organize the army sea transport service, and in December, 1898, was appointed military Governor of Havana. On May 1, 1900, he was relieved, having previously, however (in January), been promoted to be brigadier-general in the Regular Army, the first engineer since the Civil War to receive a line brigadier-generalship. He afterwards inspected technical military institutions in France, Germany, and England, for the purpose of formulating plans for a United States Army War College.

LUDOLF, lo͞o′dôlf, Hiob (1624-1704). A distinguished German Orientalist. He was born at Erfurt, and educated there and at Leyden. On leaving Leyden he traveled through Europe, and while in Rome learned Ethiopic from an Abyssinian, Gregorius by name, whom he met there. In 1654 he became tutor to the children of the Duke of Saxe-Gotha, and in 1675 Chamberlain at Altenburg. In 1678 he went to Frankfort-on-the-Main, where he died in 1704. Ludolf was one of the first of European scholars to take up the scientific study of Ethiopic, and his researches form the starting-point for the subsequent investigations of Ewald, Dillmann, and others. His chief works are: *Historia Æthiopica* (Frankfort, 1681); *Commentarius* and *Appendix* to the same (ib., 1691, 1694); *Relatio Nova de Hodierno Habessiniæ Statu* (ib., 1698); an Ethiopic-Latin lexicon (London, 1661; 2d ed., Frankfort, 1699), and grammar (2d ed., ib., 1702); and a grammar and a lexicon of the Amharic language (ib., 1698).

LUDOVISI, lo͞o′dô-vē′zē, Villa. A magnificent villa in the northern part of Rome, established on the site of the Gardens of Sallust in the early part of the seventeenth century by Cardinal Ludovico Ludovisi. The great gardens were laid out by Le Nôtre, and were planted with trees and shrubs of many countries and adorned with antique statues. The buildings were the palace, the gallery of statues, and the Casino dell' Aurora with a fresco by Guercino. The latter building alone is preserved; the grounds have been sold and built upon in recent years. The collection contained a number of valuable sculptures, among them the celebrated Ludovisi Juno and Ludovisi Mars. The marbles were removed in 1891 to the Palace of the Piombino princes, who inherited the property.

LUDWICH, lo͞od'vĭɢ, ARTHUR (1840—). An eminent German classical philologist, born at Lyck, professor in the University of Königsberg. Ludwich's most important works deal with the Homeric poems and questions relating to them. Among his writings are: *Scholia in Homeri Odysseæ Auctiora* (Königsberg, 1888); *Homeri Odyssea* (Leipzig, 1889, 1891); *Homerica I.-VII.* (Königsberg, 1893-96); *Die Homerische Batrachomachia*, etc. (Leipzig, 1896); *Die Homervulgate als voralexandrinisch erwiesen* (Leipzig, 1898); *Der Karer Pigres und sein Thierepos Batrachomachia* (1900). Besides these he is the author of many monographs on philological subjects.

LUDWIG, lo͞od'vĭᴋ, ALFRED (1832—). A German philologist and Sanskrit scholar. He was born in Vienna, was educated there and at Berlin, and in 1860 became professor of comparative philology at Prague. His published works are marked by no small originality, and by independence of commonly accepted views both in general and Indian linguistics. They include: *Der Infinitiv im Veda* (1871); *Agglutination oder Adaption* (1873); *Die philosophischen und religiösen Anschauungen des Veda* (1875); and *Der Rigveda* (1876-88), a translation, with commentary, which advances the theory, also held by Sayce, that many verb forms are mere adapted noun cases and not compounds of verb stem and pronominal suffix, the standard from the traditional side. The last work has been augumented by *Ueber die Kritik des Rigvedatextes* (1889) and *Ueber die Methode bei Interpretation des Rigveda* (1891). He also wrote on *Platons Apologie des Sokrates und Kriton* (1856; 6th ed. 1879).

LUDWIG, KARL (1839-1901). A German landscape painter, born at Römhild, Saxe-Meiningen. From the study of sculpture at Nuremberg, he turned to painting at Munich, where he was the pupil of Piloty in 1861-65. Two years afterwards he went to Düsseldorf, and in 1877-80 was professor at Stuttgart, then settled in Berlin, where he was elected a member of the Academy. Prominent examples of his extensive mountain views, chiefly from the Alpine regions, are the "Saint Gotthard Pass" (1878, National Gallery, Berlin); the same (1879, Stuttgart Museum); "Alpine Landscape" (1882) and "Albula Pass" (1892), both in the Dresden Gallery; and "On the High Frassen in Vorarlberg" (1890, bought by the Bavarian Government in 1899).

LUDWIG, KARL FRIEDRICH WILHELM (1816-95). A German physiologist, born at Witzenhausen, Hesse. He was educated at Erlangen and Marburg, became professor of comparative anatomy at Marburg in 1846, and was made professor of physiology at Leipzig in 1865. The doctrine of 'vitalism' was abandoned by physiologists largely through his researches, and many of his contributions have formed essential elements in the structure of modern physiology. His principal work is *Lehrbuch der Physiologie des Menschen* (1852-56).

LUDWIG, OTTO (1813-65). A German dramatist, novelist, and critic. He was born at Eisfeld, in Saxe-Meiningen. Obliged by ill health to give up music, which he had studied under Mendelssohn, he turned his attention to literature. He first established his reputation by two tragedies, *Der Erbförster* (1853) and *Die Makkabäer* (1854). The story *Zwischen Himmel und Erde* (1857) is a work of extreme power. His *Shakespeare-Studien* (1871, enlarged edition 1892) ranks high among critical works of its class. His collected writings were published in 1891-92.

LUDWIG SALVATOR, säl-vä'tōr (1847—). An Archduke of Austria and a traveler and author, born in Florence, the son of Grand Duke Leopold II. of Tuscany. He devoted himself in his youth to scientific studies, and developed no small skill as a draughtsman. He traveled through the Mediterranean, to Asia, Africa, and America, and his books, mostly illustrated by his own pencil, include: *Eine Jachtreise in die Syrten* (1874); *Los Angeles in Südkalifornien* (1885); *Die Balearen* (1869-91); *Um die Welt ohne zu wollen* (4th ed. 1886); and *Die Liparischen Inseln* (1897).

LUDWIGSBURG, lo͞od'vĭᴋs-bo͞orᴋ. A town of Württemberg, Germany, 9 miles north of Stuttgart. It was founded in 1706 by Duke Eberhard Louis as a rival to Stuttgart; and was later greatly enlarged by Duke Charles (Map: Germany, C 4). Ludwigsburg is the second royal residence. Fine public squares and promenades, and a royal castle, with a splendid picture gallery and gardens, are among its attractions. The main importance of the town lies in the fact that it is the chief military depot of Württemberg, with a cannon-foundry, an arsenal, and a military academy. Among its manufactures are metallic wares, musical instruments, cotton and woolen goods, etc. Population, in 1900, 19,359.

LUDWIGS CANAL. See DANUBE.

LUDWIGSHAFEN, lo͞od'vĭᴋs-hä'fen. The chief industrial and commercial centre of the Rhine Palatinate, Bavaria, situated on the left bank of the Rhine opposite Mannheim, with which it is connected by a railway bridge (Map: Germany, C 4). It has a good harbor, and extensive manufacturing establishments. These include the largest chemical works in the world (Badische Anilin- und Sodafabrik) and manufactures of various acids, fertilizers, shoddy, vinegar, flour, spirits, wagons, machinery, bridge materials, etc. Prior to 1843 the place was only of strategic importance as the tête-de-pont of Mannheim. In that year the settlement was founded by King Louis I. of Bavaria, and in 1859 was made a city. Its population increased by the annexation of adjacent places from 28,768 in 1890 to 61,914 in 1900.

LUES, lū'ēz (Lat., plague). An old term, but still much employed as a synonym for syphilis (q.v.).

LUFFT, lo͞oft, HANS (1495-1584). A German printer and publisher, commonly called 'the Bible printer,' because of his connection with Luther. In 1534 he printed at Wittenberg the first complete edition of Luther's Bible, in two quarto volumes with illuminations in gold and colors by Lucas Cranach. Lufft printed in the forty years following more than one hundred thousand copies of the German Bible. He also printed most of the other works of Luther. Consult the biography by Zeltner (Altdorf, 1727).

LUGANO, lo͞o-gä'nō. A town of the Canton of Ticino, Switzerland, on the northwest shore of Lake Lugano, 925 feet above sea-level (Map:

Switzerland, C 2). The town is entirely Italian in character, with arcaded streets and broad promenades and squares along the lake front, while the shores of the lake, with their terraced vineyards and gardens dotted with villas, give the scenery an Italian aspect. The finest edifices of the town are the Church of San Lorenzo with a marble façade, built in the fifteenth century by Rodari, and the convent Church of Santa Maria degli Angioli, containing the valuable Passion fresco by Bernardino Luini. The view from Monte San Salvatore, whose summit is reached by a cable railway, is particularly grand. Population, in 1890, 9600. Lugano was an important city during the Middle Ages, and formed a part of the Duchy of Milan till it entered the Swiss Confederation in 1512. Prior to 1881 it was one of the three alternating capitals of the canton.

LUGANO, Lake of. One of the famous Italian lakes, situated between Lakes Como and Maggiore in the southern part of the Canton of Ticino, Switzerland, and partly extending into the Province of Como, Italy. Its length, following its windings, is about 20 miles; its width nowhere exceeds 1½ miles; its depth ranges from 950 feet in its upper part to 150 feet at its lower extremity. It receives a number of mountain streams, among them the Agno, and discharges through the Tresa into Lake Maggiore. The scenery along the shore is rugged and of exceeding beauty. The lake is provided with steamboats. Lugano is its principal town.

LUGANSK, lo͞o-gänsk′. A town in the Government of Yekaterinoslav, Russia, situated on the Lugan, a tributary of the Donetz, 240 miles east of Yekaterinoslav (Map: Russia, E 5). It has manufactures of machinery, locomotives, and cannon, and produces tallow, candles, leather, and brick. It is the seat of a meteorological station, a mineralogical museum with a library, and of the special administration of the Government coal-mines in the basin of the Donetz. Lugansk grew up around an iron-foundry erected by the Government in 1795. Population, in 1897, 20,400.

LU′GARD, Sir Edward (1810-98). An English soldier. He was educated at the military college in Sandhurst, entered the British Army as an ensign in 1828, and served many years with distinction in India. He was in the Afghan War of 1842, in the campaign on the Sutlej, in that of the Punjab, and in the Persian expedition of 1857, being finally promoted to be lieutenant-general and general. He was made permanent Under-Secretary of War in 1861, and president of the Army Purchase Commission in 1871.

LUGDU′NUM. The Latin name of Lyons (q.v.).

LUGDUNUM BAT′AVO′RUM. The Latin name of Leyden.

LUGGAGE. See Baggage.

LUGGER (probably from *lug*, sail, ear, from Swed., Norw. *lugga*, to pull by the forelock, from *lugg*, forelock, hair of the head). A small vessel, carrying two or three masts, with a lug-sail (q.v.) on each, and occasionally a topsail. The rigging is light and simple, and the form of the sails enables a lugger to beat close up to the wind. Among English boats, the lug-rig rarely extends beyond the larger class of fishing vessels, though there are some very elegant lugger yachts in the different clubs. In France, however, it is a favorite rig, and is used for vessels of considerable size.

LUGG′NAGG. In Swift's *Gulliver's Travels*, an island off Japan, the inhabitants of which never die. The account of the island shows the miseries of immortality without the powers of youth and mind.

LUGO, lo͞o′gô. A town of Central Italy, in the Province of Ravenna, 17 miles west of Ravenna (Map: Italy, F 3). It has a public library and a technical school. There is an important annual fair, which lasts from the first to the thirteenth of September. The trade is large in hemp, grain, cattle, silk, wine, etc. Population (commune), in 1901, 27,415.

LUGO (Lat. *Lucus Augusti*). The capital of the Province of Lugo, in the northwestern part of Spain, situated on the left bank of the Minho, 46 miles southeast of Corunna, and on the railroad between that city and León (Map: Spain, B 1). The old city is surrounded by an ancient wall, partly of Roman origin. It is about 36 feet high and 18 feet wide, and has 85 cylindrical towers; its top offers a magnificent promenade around the city. Lugo has a Romanesque cathedral of the twelfth century. There are manufactures of leather, linen goods, and cream of tartar. It was celebrated in the time of the Romans for its warm sulphur baths. Population, in 1887, 19,952; in 1900, 28,024.

LUGOS, lụ′gôsh. The capital of the County of Krassó-Szörény, Hungary, situated on the river Temes, 34 miles east-southeast of Temesvár by rail (Map: Hungary, H 4). It is divided by the river into German and Ruman Lugos, inhabited by Germans and Magyars respectively. In the vicinity are extensive vineyards, and wine is the principal article of trade. Lugos is the seat of a Greek bishop, and has a gymnasium. It was formerly fortified. Population, in 1900, 16,126.

LUG-SAIL (from Swed., Norw. *lugga*, to pull by the forelock, from *lugg*, forelock, hair of the head). A sail in the shape of a quadrilateral, the head shorter than the foot and the luff shorter than the leech. The head is bent to a yard which is hoisted by halliards bent (i.e. made fast) about one-fourth or one-third the length from the forward end. The tack of the sail secures at the foot of the mast or a short distance forward of it. The lug-sail is a very good one for open boats, as it gives spread of canvas with a low centre of pressure; but it is inconvenient in tacking, as the yard has to be lowered and hoisted on the other side of the mast (this is called dipping the lug), and in most lug-rigs either the sheet or tack must also be dipped.

LUGWORM. An English name for the lobworm (q.v.).

LUINI, lo͞o-ĕ′nê, Bernardino (c.1475-c.1533). A Milanese painter, of the high Renaissance. He was born at Luino, on Lake Maggiore, between 1475 and 1480, the son of Giovanni Lutero. His chief master was Borgognone (q.v.), with whom he labored in the decoration of the Chapel of San Maurizio, Milan. The years between 1521 and 1530 he spent in decorating churches at Milan, Saronno, and Lugano. He was a follower of Leonardo da Vinci, though there is no record of his ever having personally known or studied under that master. The earliest work attributed to Luini, a "Pietà," in the choir of Santa Maria della Passione at Milan (1510), shows the influence of Borgognone; but his paintings between the years 1510 and 1520, including many of his easel paintings, are in Leonardo's style. After 1520, though retaining the principles of Leonardo as the basis of his work, his frescoes show greater independence of execution and more individual power. He died soon after 1533.

He chose his subjects from the Bible, sacred legends, and mythology. His portrayal, while tender and sympathetic, appealing to the emotions rather than the intellect, is accurate, the action good, and the coloring refined. His work is transitional, departing from the strength of the old masters and groping after the beauty of perfected Italian art. He worked in oil, tempera, and fresco, but is most famous as a fresco painter, and he especially excelled in church adornment.

His most important frescoes are: "The Crucifixion," in the Church of Santa Maria degli Angeli at Lugano; "Saint Catharine Borne by Angels," the "Madonna Enthroned Between Saint Anthony and Saint Barbara," in the Brera Gallery, Milan; "Christ Crowned with Thorns," in the Ambrosiana, Milan; a series of frescoes in the Church of Santa Maria at Saronno, including a "Marriage of the Virgin" and the "Presentation in the Temple;" another series in the Chapel of San Maurizio, Monastero Maggiore, Milan, and the decorations of Palazzo Litta, Milan, now in the Louvre. His easel paintings are especially numerous in the public and private collections of Milan. In the Brera are two late Madonnas, one with a rose hedge; in the Ambrosiana "Tobias and the Angel." His best-known other works include: "Beheading of John the Baptist," in the Uffizi, Florence; "Modesty and Vanity," in the Sciarra Palace, Rome; "Jesus Among the Doctors," in the National Gallery, London; "Birth of Christ," in the Berlin Museum; and "Herodias," in the Louvre. Consult: La Fenestre, "Luini," in *Gazette des Beaux Arts* (1869), vol. ii.; Gauthier, ib., vols. xxii.-xxiii.; Williamson, *Bernardino Luini* (London, 1899).

LUINO, lōō-ē′nō. A town in the Province of Como, Italy, at the mouth of the Tresa, on the east shore of Lake Maggiore (q.v.). It markets grain, wine, and fruit, weaves cotton, spins silk, has several good hotels, and is easy to reach by rail or by Lake Maggiore steamboat. Population (commune), in 1881, 3540; in 1901, 5890.

LUISE, lōō-ē′*ze*, AUGUSTE WILHELMINE AMALIE (1776-1810). Queen of Prussia. She was born at Hanover, where her father. Duke Karl of Mecklenburg-Strelitz, was in command of the garrison. She was married to the Crown Prince of Prussia, afterwards Frederick William III., in 1793. After his accession to the throne she became exceedingly popular, her great beauty being united with dignity and grace of manners, and with much gentleness of character and active benevolence. This popularity increased in consequence of her conduct during the period of national calamity which followed the battle of Jena, when she displayed a patriotic spirit, energy, and resolution. Just before Tilsit (q.v.) she visited Napoleon and sought in vain to win merciful terms for Prussia, and she brought her husband to favor Stein and Hardenberg. She died on a visit to her father in Strelitz. Her memory is cherished in Prussia, and the Order of Luise in that kingdom was founded in honor of her. Consult: Hudson, *The Life and Times of Louisa, Queen of Prussia* (London, 1874); Mommsen and von Treitscke, *Königin Luise* (Berlin, 1876); Adami, *Luise, Königin von Preussen* (12th ed., Gütersloh, 1888).

LUISE DOROTHEA, dŏ′rō-tā′ȧ (1710-67). A Duchess of Saxe-Gotha and Altenburg, of marked literary tastes. She was born at Coburg, and after the death of her father, in 1724, was educated by her stepmother, Elizabeth Charlotte, daughter of the Great Elector. In 1729 she married her cousin, the Crown Prince of Gotha, later Duke Frederick III.; she bore him four children, of whom the third, August, was a friend and patron of Wieland, Herder, and Goethe. Luise took some interest in politics, but much more in literature and science, and carried on a varied correspondence with French men of letters, especially Voltaire, Diderot, and D'Alembert, and also with Frederick the Great.

LUISE VON GALL, fôn gȧl. The pseudonym of the wife of Levin Schücking (q.v.).

LUITPOLD, lōō′ĭt-pōlt, KARL JOSEPH WILHELM LUDWIG (1821—). Prince Regent of Bavaria. He was born at Würzburg, and married in 1844 the Archduchess Augusta of Tuscany. He fought in 1866 against Prussia, but was on the general staff of the Prussian Army in the war of 1870-71. On the death of his nephew, Louis II. of Bavaria, in 1886, Prince Luitpold became Regent, owing to the insanity of Otho, the new King.

LUITPRAND, lōō′ĭt-pränd. See LIUTPRAND.

LUKÁCS, lṳ′käch, BÉLA VON (1847-1901). An Hungarian statesman, born at Zalatna. He studied law at Pesth, was elected to the Diet in 1872, and in 1886 became director of the Hungarian State railways, in which capacity he introduced important reforms. On the death of Baross, in 1892, he became Minister of Commerce. He wrote a number of financial works, including a treatise on the *Financial and Tax System of Austria and Hungary* (1876); one on the *Austro-Hungarian Bank* (1882); and others on the financial administrations of Rumania, England, and France.

LUKASZEWICZ, lṳ′kȧ-shĕv′ĭch, JOZEF (1799-1873). A Polish historian, born at Kromplevo, near Posen, and educated at the gymnasium of Posen. In 1829 he was appointed librarian of Count Raczynski. With Poplinski he formed a Polish press and publishing house, and edited *Tygodnik Literacki*, *Przyjaciel ludu*, and *Oredownik*. In 1852, after teaching Latin several years in Posen, he bought the Targoszyce estate and resigned from his position as librarian. His works include a translation of Pliny's *Natural History* (1845); the Protestant histories: *Hiadomośc historyczna o Dyssydenbach w mieście Poznaniu w XVI. w XVII. wieku* (1832; translated into German, 1843), on the history of dissent in Posen; a work on the Bohemian Brethren, *O Kościolach Braci Czeskich w dawnéj Polsce* (1835); and, on the Calvinist body in Lithuania, *Dzieje kościolów wyznania helweckiego na Litwie* (1841-43); the Catholic ecclesiastical history, *Krótki opis historyczny kościolow parochialnych* (1858-63); a sketch of Posen, *Obraz historyczno-statystyczny miasta Poznania* (1839); a geography, written with the pseudonym J. Andryszowicz, *Geografia starozitnej Polski* (1842);

and the valuable history of Polish education, *Historya szkól w Koronie i W. Ks. Lit.*, etc. (1849-51).

LUKE (Lat. *Lucas*, Gk. Λουκᾶς, *Loukas*, probably contracted from Lat. *Lucanus*). The author of the third Gospel and the Book of Acts in the New Testament. There is little direct information concerning Luke. According to tradition and an old reading of Acts xi. 27, which Zahn (*Einleitung*, p. 334) thinks reliable, he was a member of the church at Antioch as early as c.40 A.D. This, however, is not certain. The 'we' sections of Acts (xvi. 10-18; xx. 5-xxi. 18; xxvii. 1-xxviii. 16) show that he was a member of Paul's missionary company when the latter, on his second journey, c.50 A.D. (Acts v. 36-xviii. 17), sailed from Troas to Macedonia. He seems to have stayed at Philippi until the Apostle stopped at that place (spring of 56) on his return from his third journey (Acts xx. 6). Luke accompanied Paul to Jerusalem, and was probably in attendance on him during his two years' imprisonment at Cæsarea. As one of Paul's companions on the voyage to Rome, he experienced the shipwreck and its attendant sufferings. At Rome, during the Apostle's two years' imprisonment (59-61), he seems to have resumed his practice of medicine (cf. Col. iv. 14), and also assisted Paul in Christian work (cf. Philem. 24). He was a faithful attendant on Paul in his second Roman imprisonment (c.64-65), even when other friends had deserted him (II. Tim. iv. 11). Later in life, probably after Paul's death, he wrote his Gospel, primarily for the benefit of one Theophilus, a man of some rank, according to tradition a resident of Antioch (cf. Luke i. 1 sqq.). He afterwards wrote the Acts, dedicating it to the same friend (Acts i. 1).

Luke was of Gentile extraction. His works show him to have been a man of culture, and his faithfulness to Paul, with the latter's affectionate mention of him (Col. iv. 14), is evidence of a sincere, warm-hearted spirit. Contrary to the common view, Professor Ramsay thinks that Luke was a native of Macedonia and met Paul first at Troas (Acts xvi. 10). For details as to Luke's writings, see LUKE, GOSPEL OF, and ACTS OF THE APOSTLES. Consult, besides the commentaries on Luke: Zahn, *Einleitung in das Neue Testament*, vol. ii. (Leipzig, 1900); Ramsay, *Saint Paul the Traveler and the Roman Citizen* (New York, 1896).

LUKE, GOSPEL OF. The third of the New Testament Gospels. It is peculiar in the amount and arrangement of its material, the reason for which is given in the prologue to the narrative (i. 1-4). In this prologue it is clearly stated that the author's purpose in writing the narrative was that its recipient, Theophilus, might know the certainty (*τὴν ἀσφάλειαν*) regarding the word (*λόγων*) in which he had been catechetically instructed (*κατηχήθης*). With a view to this he desired to write him an orderly record (*καθεξῆς*) of this history, having carefully followed it up from its beginning (verse 3), consulting, evidently, not merely such fragmentary accounts of it as had been variously prepared (verse 1), but also the primary witnesses to it and proclaimers of it on whose personal evidence these accounts rested (verse 2). His plan was, consequently, much more historical in its conception than that of Matthew or Mark, and presents in its working out the naturally resultant characteristics which we should expect to find. Of the four Gospels its narrative is the most complete in its extent, beginning not merely with the annunciation of Jesus' birth (i. 26-38)—as Matthew does—but with that of the birth of John the Baptist (i. 5-25), and ending with a passage which must be taken as the Evangelist's statement of the ascension (xxiv. 50-53). Within these limits this Gospel is also the fullest in the number of events which it records, almost one-third of all the sections contained in the Synoptic narrative being peculiar to it. This specialty of material is seen particularly in its account of what is commonly known as Jesus' last journey to Jerusalem (ix. 51-xix. 28). Though some of the items in this long passage evidently belong elsewhere in the narrative, no other of the Gospels gives this portion of the history so fully as does this one, the larger part of these ten chapters being peculiar to it.

In view of these facts the arrangement which the Evangelist has given his material is interesting. After the prologue there is a passage devoted to the prefatory history, containing the annunciation of the births of John the Baptist and of Jesus (i. 5-38), with the visit of Mary to Elizabeth (i. 39-56); the birth of John, with the prophetic song of Zacharias (i. 57-80); the birth of Jesus, preceded by the enrollment decree and followed by the visit of the shepherds (ii. 1-20); the circumcision and presentation in the Temple, with the prophetic song of Simeon (ii. 21-40); and the later visit of the boy Jesus to Jerusalem (ii. 41-52). The ministry of Jesus is then introduced by the preliminary narrative prefaced by a statement of the political situation at that time (iii. 1-2a), and containing an account of the ministry and death of the Baptist (iii. 2b-20), and the symbolic induction of Jesus into His work (iii. 21-iv. 13), in the midst of which is inserted the genealogical record (iii. 23-38). The public ministry of Jesus is divided, largely as in Mark, into two main portions. The first gives an account of Jesus' work among the people (iv. 14-ix. 17). Unlike Mark (q.v.), however, or even Matthew (q.v.), the scene of this work is wholly confined to Galilee, no account being given of the popular work in the region north of Galilee. This is then followed by the second portion, which is apparently intended by the Evangelist to describe Jesus' work of instruction, mainly among His disciples (ix. 18-xix. 28). The scene of this portion is unequally divided, a few verses being given to the instruction in the regions near to Galilee (ix. 18-50)—which thus, after all, attaches Luke's narrative geographically to Jesus' work in the north country, the larger part being given to the instruction on Jesus' so-called last journeyings to Jerusalem (ix. 51-xix. 28). Of these two portions the former, though so much smaller, contains that which is fundamental to the whole instruction, recording the disciples' confession at Cæsarea Philippi (ix. 18-21), the transfiguration (ix. 28-36), and the initial announcements by Jesus of His passion (ix. 22-27, 43-45); the latter is conspicuous for the parabolic element in it (see chs. xii.-xix.). The ministry in Jerusalem (xix. 29-xxi. 38) gives the public entry into the city (xix. 29-48), the conflict with the leaders of the people (xx. 1-47), and Jesus' eschatological discourse (xxi. 1-36)—the narrative closing with the passion and the resurrection (xxii. 1.-xxiv. 49). To this is added what was intended by the Evangelist to be a statement of the ascension (xxiv. 50-53)—a statement which is enlarged by him in the opening verses of the Book of Acts (i. 1-12).

While it is generally admitted that the third Gospel is the latest of the three Synoptic Gospels (see GOSPELS, *Synoptic Problem*), it is a matter of considerable critical debate whether, in his narrative, the author made use of Matthew as well as of Mark. But whatever sources he used, canonical and extra-canonical (cf. the statement in i. 1-4), it is characteristic of his work that it is done, not only with an historical aim in view, but in a literary spirit. This is clear from his constant tendency to enrich the narrative rhetorically—his ability to do which is evident from the literary character of his prologue. At the same time no other Evangelist uses such striking Hebraisms and uses them so conspicuously as this one. The combination of these two elements gives a versatility to his style which is not possessed by any other of the Evangelists. A marked example of this quality of style is seen in the sharp change from the classical prologue (i. 1-4) to the Hebraistic narrative of the nativity (i. 5-ii. 52). That this Hebraism comes from the linguistic character of the sources used may be granted; but the author's willingness to use it, as he does, in the narrative of purely Hebrew events (note the difference in the linguistic character of the story of the Jerusalem Church and the record of Paul's travels in the Book of Acts, and notice that the Hebrew element is practically nearly absent from the Palestinian narrative which the Gospel gives) shows on his part a certain literary conception of what was proper in the treatment of the different lines his narrative pursued.

It is generally admitted that, whoever the author was, he was identical with the author of the Book of Acts—and further that he was not an eyewitness of the Gospel events, though he was not necessarily outside of the Gospel generation. In fact, the latter point is practically stated by the author himself in his prologue (cf. i. 2).

From the evident literary character of the author's writings it is most natural to infer that he was a Gentile Christian of Greek culture. This is questioned, indeed, by only a few scholars. At the same time, from a survey of its theological views, as well as its vocabulary and its phraseology, it is plain that the author is of a strikingly Pauline cast of mind, the only question practically being as to the degree of his Paulinity. Unlike the other Gospels, this one names the reader for whom it was intended—a certain Theophilus (i. 3). From the term used in addressing him (*κράτιστε*), he was evidently a man of rank; while, from the general Gentile tenor of the narrative—especially the evident ignorance regarding Palestinian geography and Jewish customs which it implies on its reader's part—he was clearly a Gentile Christian. The Gospel gives no hint of Theophilus's residence, though such tradition as exists makes it Antioch. The author's motive is clearly given in the prologue—that Theophilus might have certain knowledge of the words regarding which he had been instructed (i. 4). From this it is evident that the reader, who was either a convert or well advanced toward an acceptance of Christianity, stands as a type of the general class for which the Gospels were written. They had been instructed orally and largely on religious, if not doctrinal lines, as candidates for baptism (note the significant use of the word *κατηχήθης*, in i. 4), the historical background not having been prominent, to say nothing of complete. To such, especially if gathered from paganism, it became a matter of interest and of importance to know the full history which stood behind the salvation which had been taught them. See ACTS OF THE APOSTLES.

As to the time of this Gospel's writing there is an absence of the marks which in Matthew and Mark seem to indicate a date previous to the destruction of Jerusalem (A.D. 70). On the other hand, the military terms in such passages as xix. 41-44 and xxi. 20-24 (terms peculiar to this Gospel) would readily agree with the event having taken place when the author wrote; while the announcement of the Second Advent does not seem to be connected so much with this definite catastrophe as with the indefinite future of the times of the Gentiles being fulfilled (cf. xxi. 24-28 as compared with Mark xiii. 19-27 and Matt. xxiv. 21-31, and see further such comparisons as Luke xxi. 7 with Mark xiii. 3-4 and Matt. xxiv. 3, Luke xxi. 12 with Mark xiii. 9; though, on the other side, we cannot but notice in Mark xiii. 10-12 and Matt. xxiv. 12-14 far-reaching future statements to which Luke has no parallel). On the whole the most likely date is between 70 and 80.

In the internal evidence there is nothing which would render impossible an authorship by Luke, the companion of Paul. In fact, such conclusion is the general though not the unanimous opinion of criticism. Patristic evidence, however, is very clear, summing itself up into a witness to the existence of the book as far back as the last decade of the first century, and a recognition of its Lukan authorship as far back as the second half of the second century. According to the common literary custom of the first century age, the name of the author must have been originally prefixed to the dedication of the book (i. 1-4). From this place it evidently was transferred to the title of the book as the book came to be accepted into the canon. The only title ever attached to the book, however, points to the name of the author as Luke.

Professor Blass of Halle has carried out in application to this Gospel his suggestion originally made regarding the two text forms of the Book of Acts; only, in the case of the Gospel, the shorter text is represented in that of the Codex Bezæ (D), the longer in that of the New Testament.

BIBLIOGRAPHY. Besides the usual New Testament introductions, the introductory portions of the more recent commentaries on Luke, and the special Synoptic works referred to in the literature cited under MATTHEW, GOSPEL OF, consult: Halcombe, *Gospel Difficulties, or the Displaced Section in Luke* (London, 1888); Bakhuyzen, *Dogmatisch Karakter dat van het Evangelie van Lucas wordt teegekend* (Amsterdam, 1888); Feine, *Vorkanonische Ueberlieferung des Lukas in Evangelium und Apostelgeschichte* (Gotha, 1891); Krenkel, *Josephus und Lukas* (Leipzig, 1894); Bernard, *The Songs of the Holy Nativity* (London, 1895); Blass, *Evangelium*

Secundum Lukam (Leipzig, 1897); id., *Philology of the Gospels* (Eng. trans. London, 1898); Vogel, *Zur Charakteristik des Lukas nach Sprache und Stil* (Leipzig, 1899); Wright, *The Gospel According to Luke in Greek* (London, 1900).

LUKE OF PRAGUE (c.1460-1528). A bishop of the Bohemian Brethren. He was born in Bohemia, studied at Prague, visited Constantinople and the East to see if there were primitive Christians there (1491), and Italy and France to confer with the Waldenses (1497-99). He was chosen bishop in 1500. The Bohemian Brethren had in him a stanch and wise defender. He improved their ritual, prepared their catechism and hymn-book (1505)—certainly among the earliest publications of the kind—wrote against their critics, and brought them into contact with the German reformers (1522 and 1524). In all he wrote some 80 volumes in Latin and Bohemian.

LULE, lōō′lȧ. A tribe or confederacy with several subtribes, apparently constituting a distinct stock, formerly roving over the Chaco region of Northern Argentina. In 1690 the Jesuit Barcena wrote a grammar of the language which he called the *Tonicote*, after one of their subtribes. Another grammar of the language was published by the missionary Machoni in 1732. They are now extinct, the nearest representatives of the ancient tribe appearing to be the Vilela, on the Vermejo River, in extreme Northeastern Argentina.

LULEÅ, lōō′lē-ą. A port of Sweden, situated on the Gulf of Bothnia at the mouth of the Lule-Elb. After the fire in 1887 it was rebuilt on a regular plan with straight streets. Since it became a railroad terminus in 1889 it has grown rapidly in importance, being the chief export town for Gellivara iron ore. Other exports are lumber, tar, reindeer, skins, and salmon. A steamship line runs to Stockholm. Population, in 1901, 9484.

LULL, Ramon. See Lully, Raymond.

LULLY, lül′lĭ, or **LULLI**, Jean Baptiste (1633-87). A celebrated composer, and the founder of the French opera. He was born at Florence, the son of a miller, and displaying, while still a child, a remarkable natural gift for music, he was educated by a monk in the use of the guitar. At the age of fourteen he went to Paris and found employment as scullion in the household of the Princess de Montpensier. He, however, taught himself to play the violin, and was placed among the 24 violinists attached to the service of the King. He soon undertook composition, and so successfully that the King, having heard him perform his own pieces, made him the leader of a new band, called 'les petits violons.' He was subsequently appointed superintendent of Court music, and finally placed at the head of the Académie Royale de Musique, which the King founded in 1669, and was made one of the King's secretaries. He composed 19 operas, besides ballet music and miscellaneous pieces, and even such composers as Handel and Purcell have not hesitated to acknowledge their obligations to him. He was on terms of intimacy with Molière, composed music for some of his pieces, and even acted with success in his comedies. He gave to his adopted country the fundamental principle of what has since come to be recognized as the French school of opera, and introduced simplicity and directness of expression. Up to 1778 Lully's operas continued to hold the public favor; but after Gluck, Piccini, and Paisiello came into fashion he was heard no more. *Alceste* (1674), *Thésée* (1675), *Persée* (1682), and *Armide* (1686) are his most important compositions. He died in Paris.

LULLY, Raymond (Raimundo Lullo, Ramon Lull) (c.1235-1315). One of the remarkable men of the thirteenth century and a pioneer in Europe in the study of the Arabic language and Mohammedanism. He was born at Palma, on the island of Majorca, of good family, about 1235. In his youth he led a dissolute life as courtier and soldier. But about 1266 he withdrew to solitude, and for five years led the hermit's life. The sudden change produced a fervid and enthusiastic state of mind, under the influence of which Lully formed the project of a spiritual crusade for the conversion of the Mussulmans, an idea he never afterwards abandoned. In 1272 he entered the Third Order of Saint Francis, and two or three years later persuaded King James of Aragon to found a monastery in Majorca to train missionaries for his project. In pursuance of this plan he studied theology, philosophy, and the Arabic language. The better to prosecute his studies, he betook himself to Paris, and received his degree there in 1288. He returned to Spain, where he taught and strove to enlist popes and princes in his enterprise. His success was not great, and at the end of 1291 or beginning of 1292 he went to Tunis to carry on his work single-handed. He drew large crowds of attentive hearers, and held disputations with learned Mohammedans, who, however, were as anxious to convert him as he to convert them, and the result was that little impression was made by either of the parties. Finally, however, Lully was thrown into prison and expelled from the country. After lecturing at Naples for several years, he proceeded to Rome; thence to his native island of Majorca, where he labored for the conversion of the Mohammedans and Jews; thence to Cyprus and Armenia, zealously exerting himself to bring back the different schismatic parties of the Oriental Church to orthodoxy. In 1306-07 he again undertook to prove the truth of Christianity to the Mussulmans of Africa, and was again expelled. He subsequently went to Paris, and lectured against the principles of Averroës. His appeals to the Pope were not altogether fruitless, inasmuch as he induced Clement V. to provide for instruction in Oriental languages at Rome, Paris, Oxford, Bologna, and Salamanca. In 1315 Lully undertook a third mission to Africa. Eager for martyrdom, he threatened the people with divine judgment if they refused to abjure Mohammedanism. At Tunis he was dragged out of the city, stoned, and died of his wounds on a vessel at sea near the island of Cabrera, June 30, 1315. His body was carried to Majorca, a fine tomb was erected, and stories of miracles have gathered about it. Lully's system of logic, to the elaboration and dissemination of which he gave much time and labor, professed to aid the mind in the acquisition and retention of knowledge by systematic arrangement of subjects and ideas and a fantastic scheme of mechanical help. It is set forth in his *Ars Magna*. He wrote a great number of treatises, theological, philosophical, and dealing with alchemy, in which he won the repute of a master. His reported achievements in this line, which gained him the title of *doctor illuminatissimus*, are no doubt exaggerated, but he made certain real and valuable discoveries. His style is involved, figurative, and obscure. An incomplete and uncritical edition of his works, begun by Salzinger, appeared in eight volumes, at Mainz, 1721-42. A new edition has been undertaken by Rossolló (Palma, 1886 sqq.). For his life, consult: Helfferich (Berlin, 1858), and Brambach (Karlsruhe, 1893); consult also: Stöckl, *Geschichte der Philosophie* (Mainz, 1875); Pruntl, *Geschichte der Logik*, vol. iii. (Leipzig, 1867); Pelayo, *Historia de los heterodoxos* (Madrid, 1880); Zwemer, *Raymond Lully, First Missionary to the Moslems* (New York, 1902); Frost, *The Art de Contemplacio of Ramon Lull* (Baltimore, 1903).

LULONGO, lŏŏ-lŏṉ'gō. A tributary of the Congo. It rises in the north-central part of the Congo Free State and flows in a westerly direction, joining the Congo at Lulongo.

LUMACHELLE, lụ'mȧ'shĕl' (from It. *lumachella*, diminutive of *lumaca*, snail, from Lat. *limax*, snail). A dark-brown shell marble with a brilliant fire-like or chatoyant internal reflection that comes from the shells occluded in it. The best-known varieties come from Bleiberg, Austria, and from Astrakhan, Russia.

LUMBA'GO (Lat., disease or weakness of the loins). A very common and painful affection of the muscles of the loins and their tendinous attachments. It comes on suddenly, and in very severe cases completely incapacitates the patient, who may be unable to turn in bed or to rise from the sitting position. It is caused generally by conditions favorable to the development of rheumatism, such as cold and exposure. It may follow exposure to a draught of air. Men, especially laborers, and those of a rheumatic or gouty habit, are more prone to this affection. One attack renders the sufferer more liable to others. The affection may become subacute or even chronic. The pain is often very severe; it may be a dull ache, but is usually sharp and cramp-like. It may be constant, or may occur only when the muscles are contracted by an effort to move. The affection may last for a few hours, or it may be prolonged for several weeks. Pressure on the affected part usually gives relief. It may be distinguished from kidney disease by the nausea, vomiting, chills, fever, condition of the urine, and other characteristics of the latter. In the treatment of lumbago, rest is of the first importance. Acupuncture is a very efficient means of relief. Sterilized needles, from three to four inches in length, are thrust into the lumbar muscles at the seat of the pain, and withdrawn after five or ten minutes; in many instances this treatment gives immediate relief. The constant galvanic current is sometimes very beneficial. The thermocautery, hot fomentations, a Turkish bath, and, in obstinate cases, a blister may be employed. In chronic cases iodide of potash, guaiacum, and sulphur may be used. Those subject to lumbago should be warmly clothed, and should, if possible, avoid cold and dampness. Consult Dana, *Text-book of Nervous Diseases* (New York, 1901).

LUMBER INDUSTRY (probably connected with Swed. *lomra*, to resound, from dial. Swed. *ljumm*, Icel. *hljömr*, sound, Goth. *hliuma*, hearing; so called as being 'lumbering' things). The production and manufacture of timber for building purposes (boards, planks, joists, shingles, etc.), telegraph-poles, timber for ship-building, railroad-ties, pulp-wood, paving-blocks, wood for furniture manufacture and cabinet-work, is one of the most extensive and important industries of the world. The United States, British America, Russia, Sweden, Germany, and France are the chief lumber-producing countries, though tropical States and colonies furnish many beautiful varieties of timber, such as mahogany, ebony, and rosewood, which are chiefly used in furniture-making.

With the increasing demands for lumber there has been a corresponding increase in the varieties of wood available for various industrial purposes. Substitutes have been found for many of the varieties of lumber which served as standards for so many years, and often such substitutes have proved superior to the woods displaced. With industrial progress, distant countries have been drawn upon to fill the supply, and in this way woods eminently suited for particular purposes have been obtained.

LUMBER TRADE OF THE UNITED STATES. *History.*—In earlier days an important part of the lumber trade of the United States was the getting out of long timbers to be used as masts and spars. The tall evergreens of Maine and later of Oregon and Washington have been cut for this purpose. Since the introduction, in 1860, of the process of making paper from wood-pulp, the procuring of this material has attained great importance. For years wood was, and in many rural sections still is, the principal fuel. But the use of wood for building purposes creates the chief demand, especially for the white pine.

The lumber industry consists of three branches, which are defined in the sections on the lumber industry of the Twelfth United States Census as follows: "(1) The logging industry, including the felling of timber, cutting it into lengths, and transporting it by rail or river to the mill. This industry is carried on in part by individuals who own or operate sawmills. The raw material of this industry consists of standing timber, the finished product consists of logs delivered at the mill. (2) The sawmill industry, in which the raw material consists of saw-logs, and the product of rough lumber, including beams, joists, scantlings, boards, shingles, laths, etc. (3) The planing-mill industry, in which the raw material consists of rough lumber and the finished product of planed, with such minor manufactures as are carried on in connection with these mills. Some of the planing-mills are operated in connection with sawmills, as a part of their operations, while others are under separate ownership and management." During the last half of the nineteenth century great improvements were introduced in all three branches of this industry.

The modern lumber camp is as completely organized as the modern factory. The laborers are divided into swampers, road-makers, choppers, sawyers, loaders, and teamsters. In the Northeastern and Lake States the business is conducted chiefly in the winter, but in other parts of the country it is carried on the year around. River-driving is still practiced wherever possible, but as the timber-supply beside the watercourses has been exhausted, other means of transportation have been resorted to. The logs are carried out of the woods by teams, on temporary log roads. In the Adirondack forests enormous loads are drawn on sleighs by a single pair of horses, the roads being previously flooded and frozen, so that their surface is a glare of ice. In the South and West temporary railroads are often built into the forests to transport the logs. In the far West machinery is used to a far greater extent than in the East for handling logs, on account of the greater size of the timber. Donkey-engines are used in the woods for handling the logs and débris, and similar engines or wire cables for dragging the logs over skid or other roads to the railway. Cranes are employed for loading the logs onto the trains.

In sawmill machinery many changes were introduced during the last century. The primitive frame or pit-saw was superseded by the circular saw, which was invented in England in 1777, but did not come into use in America till many years later.

The first insertible teeth for this saw were invented by W. Kendall, an American, in 1826. Gang-saws, which had been known in Europe since the sixteenth century, kept pace with the rotary saws in their introduction into American forests. The band-saw, the perfection of sawmill machinery, though invented in England in 1808, and patented soon afterwards in America, did not come into operation till 1872, when it was first used for cutting hard woods in the Maumee Valley of Ohio. Other improvements in saw-mill machinery are the direct steam-feed, the steam-nigger, or log-turning device, endless chains for bringing the logs into the mill, and mechanical carriers for lumber and for refuse. In addition to these there are the shingle, lath, and slab saws, which last by using up inferior materials reduces the amount of refuse. There are also planing, molding, matching, and flooring machines. Lumber, instead of being seasoned by the slow process of natural drying, is often put into special drying-kilns, where the process is expedited by artificial heat. See WOOD-WORKING MACHINERY.

STATISTICS OF LUMBER INDUSTRY IN THE UNITED STATES. The steady growth in the various branches of this industry is shown by the following statistics of the Twelfth (1900) United States Census. The tendency toward concentration and consolidation, so marked in all branches of manufacture, is evident in this industry, for the increase in number of establishments has not kept pace with the increase in capital invested and annual product.

	1850	1860	1870	1880	1890	1900
Number of establishments	18,769	20,659	25,832	25,708	22,617	33,035
Capital invested	$41,444,364	$74,530,090	$143,493,232	$181,186,122	$557,881,054	$611,611,524
Value of product (annual)	60,413,187	96,715,856	210,159,327	233,268,729	437,957,382	566,832,984

During 1899 the timber cut of the United States was estimated by the Bureau of Statistics at Washington as 100,000,000 tons (reckoning a ton as equal to 400 feet board measure). Of this amount, 75,000,000 tons is coniferous timber and the remainder oak and other hard woods. The total forest area is given as 700,500,000 acres, being about 37 per cent. of the total area of the country, and giving a wooded area of nine acres

TABLE I.—EXPORTS OF TIMBER, LUMBER, AND MANUFACTURED WOOD*

KINDS	1898	1899	1900
Timber and unmanufactured wood	$7,757,291	$8,242,527	$11,569,166
Boards, deals, planks, joist, and scantling	12,467,989	15,403,016	18,282,191
Shingles, shooks, staves, headings, and all other	8,189,753	8,128,698	9,514,221
Total	$28,415,033	$31,774,241	$39,365,578

* Not including doors, sash, blinds, furniture, barrels, etc., valued at $11,230,798 in 1900.

TABLE II.—EXPORTS OF WOOD AND MANUFACTURES OF WOOD, BY CLASSES

KINDS		1891	1892	1893	1894	1895
Sawed timber	M feet	214,612	235,550	214,198	237,830	297,698
Hewn timber	cubic feet	6,900,073	6,736,446	7,836,921	4,082,709	6,039,539
Logs and other	dollars	2,274,102	1,923,604	2,270,072	2,636,608	1,813,894
Boards, deals, planks	M feet	613,406	592,596	629,355	574,920	588,781
Joist and scantling	"	11,324	16,131	13,475	12,412	27,454
Shingles	"	42,463	31,198	22,938	28,277	40,122
Shooks, box	dollars	199,674	195,618	238,605	275,140	359,451
Shooks, other	"	450,492	585,919	702,403	620,311	565,404
Staves	number	....	....	....	....	....
All other lumber	dollars	886,133	1,051,397	1,443,537	1,602,293	1,642,370

KINDS		1896	1897	1898	1899	1900
Sawed timber	M feet	332,934	391,291	338,575	406,448	473,542
Hewn timber	cubic feet	5,616,476	6,406,824	5,489,714	4,796,658	4,416,741
Logs and other	dollars	2,796,043	3,945,106	3,189,820	3,262,589	5,020,471
Boards, deals, planks	M feet	694,799	876,689	790,659	970,170	1,046,758
Joist and scantling	"	31,415	36,253	35,610	34,294	41,043
Shingles	"	56,047	58,508	50,524	73,791	86,118
Shooks, box	dollars	514,973	529,492	486,860	434,290	587,047
Shooks, other	"	638,339	597,606	557,895	588,961	773,019
Staves	number	....	....	54,142,759	44,382,689	49,011,533
All other lumber	dollars	2,149,891	3,162,470	3,256,880	3,081,295	3,091,336

per capita of population. The accompanying tables (I. to III.), taken from *The Lumber Trade of the United States* (see Bibliography at end of article), show the foreign lumber trade of the country.

CONSERVATION OF THE TIMBER SUPPLY. Until recent years, the greatest wastefulness characterized lumbering operations in America. Two causes produced this: The abundance of lumber and the desire to clear the land rapidly for agricultural purposes. As a result, forest areas have been rapidly exhausted, and the great centres of the lumber trade have moved steadily westward. Probably the greatest lumber market of the world, at the close of the nineteenth century, was Chicago, which receives its supplies from the forests of Michigan, Wisconsin, and Minnesota. But these forests are beginning to show signs of exhaustion, especially in the supply of white pine, and the attention of American scientists, economists, and legislators has been directed to the necessity of regulating the cutting of timber. The ruthless clearing of the great wooded tracts not only menaces the nation's timber supply, but vitally affects its water resources. It is probable that the twentieth century will see the science of forestry and the art of systematically producing wood crops established in America.

TABLE III.—IMPORTS AND EXPORTS OF WOOD AND MANUFACTURES OF WOOD COMPARED

YEAR	Imports	Exports
1891	$19,888,186	$26,270,040
1892	19,846,438	25,790,571
1893	28,152,599	26,666,439
1894	18,154,073	27,712,169
1895	17,814,119	27,115,907
1896	20,567,967	31,947,108
1897	20,543,810	39,624,800
1898	13,861,923	37,513,252
1899	14,502,355	41,489,526
1900	20,591,908	50,598,416

Already many State governments have taken steps to prevent forest fires and have preserved areas from the ravages of lumbermen by converting them into State parks. In the four years, 1897-1900, the State of New York acquired over 1,000,000 acres of forest lands. Pennsylvania has made a start toward the acquisition of forest preserves and the proper treatment of such tracts. Indiana has a State Forestry Commission under a law making it the duty of that body "to collect, digest, and classify information respecting forests, timber lands, forest preservation, and timber culture;" while another law encourages timber culture by allowing the owner of any tract to reserve one-eighth of its area for forest preservation, and to be exempted from taxation of such forest land at more than $1 an acre. Several American universities have faculties of forestry, one of these having been endowed by the State of New York with 30,000 acres of forests, for the practical instruction of students.

TABLE IV.—VALUE OF THE EXPORTS OF TIMBER FROM THE DOMINION OF CANADA

PERIOD	Annual exports in £			Total	In per cent.		
	To Great Britain	To the United States	To other countries		To Great Britain	To the United States	To other countries
1870-79	2,627,000	1,481,000	428,000	4,536,000	58	33	9
1880-89	2,212,000	1,876,000	389,000	4,477,000	49	42	9
1890-99	2,493,000	2,427,000	327,000	5,247,000	48	46	6

FOREST POLICY OF THE UNITED STATES. The movement for the establishment of national forest reserves which was begun during the administration of President Harrison (1888) was extended till there were in 1901 38 reserved tracts containing over 46,000,000 acres, or 72,000 square miles, scattered through the Rocky Mountain region. The act of June 4, 1897, provided for a system of timber-cutting from reservations, thereby providing a source of income for the expenses of forest administration, and, at the same time, for the local demands for lumber in the vicinity of reservations. On July 1, 1898, the reserves were placed in control of a system of graded officers. In 1900 this force consisted of 9 superintendents, 39 supervisors, and 350 forest rangers, the latter number varying with the seasons and the danger from fire. The patrolling of these reservations by forest rangers has greatly reduced the number of forest fires, checked the depredations of timber trespassers, and caused the enforcement of the regulations regarding sheep-grazing and timber-cutting and sales. On July 1, 1901, the department of forestry, which had previously been only a division, was made a separate bureau, known as the Bureau of Forestry of the Agricultural Department, with three divisions of its own. See FORESTRY.

LUMBER TRADE IN CANADA. In Canada, as in the United States, large amounts of lumber are made into pulp for the manufacture of paper. It is estimated that Canada has 800,000,000 acres of land classed as forests; but, according to the statement of the Chief Inspector of Timber and Forestry, only one-third of this area can be considered timber land of merchantable value. Large areas of the most valuable forest land have been swept by fires. The accompanying tables (IV. and V.) show the value of the exports of timber from the Dominion of Canada. They were taken from Dr. Schlich's article on "The Outlook of the World's Timber Supply" (see Bibliography). Tables V. and VI. are from the same source.

TABLE V.—AREA OF FORESTS IN THE DOMINION OF CANADA

PROVINCES	Area of woodlands in acres	Percentage of woodlands to total area	Area per capita in acres
Prince Edward Island	510,000	40	5
Nova Scotia	4,137,000	31	9
New Brunswick	9,450,000	53	29
Ontario	65,356,000	46	31
Quebec	74,573,000	51	50
Manitoba	16,401,000	40	107
British Columbia	182,756,000	75	1,885
Territories	446,049,000	29	4,506

LUMBER TRADE IN EUROPE. The accompanying table shows (1) the area of forests in Europe, and (2) the net annual imports or exports of lumber from European countries. From these two tables it is evident that not quite one-third of the area of Europe is forest land, and that the average area per capita is about two acres; that the chief importers of lumber are Great Britain and Germany, and the chief exporters Russia and Sweden. In Great Britain the annual importation of timber has increased at the rate of 189,900 tons for the last thirty-five years, and at the rate of 332,000 tons for the closing decade of the century. The price per ton for coniferous timber increased from £1 17s. 7d. per ton in 1895 to £2 3s. 2d. in 1899. Of the timber imported 87 per cent. was coniferous, 3 per cent. oak, 3.6 per cent. mahogany, and other furniture woods, 3.6 per cent. house and door frames, 2.8 per cent. miscellaneous.

In Germany, in addition to the 4,600,000 tons of timber imported, there is an annual production of 38,000,000 tons of lumber from the German forests, of which 15,000,000 tons are used for timber and 23,000,000 tons for fire-wood. It is estimated that about 4,000,000 people in Germany are engaged in work connected with forest industries. In France the annual production of the native forests is about 18,000,000 tons, of which 14,000,000 tons, mostly coppice woods, are used for fuel.

TABLE VI.—AREA OF EUROPEAN FORESTS AND NET IMPORTS OR EXPORTS OF LUMBER IN EUROPEAN COUNTRIES *

COUNTRIES	Area of forests	Percentage of total area in forest land	Percentage of forest area belonging to State	Acres of forest land per capita	Tons imported annually, net	Tons exported annually, net	Value in dollars	
							Imports	Exports
Sweden	48,000,000	44	27	8.9	...	4,460,000	...	38,619,000
Norway	17,000,000	21	12	8.4	...	1,040,000	...	9,107,000
Russia	516,000,000	40	61	5.9	...	5,900,000	...	4,334,000
Bosnia & Herzegovina	6,790,000	53	70	4.9				
Bulgaria	10,650,000	45	...	3.2	50,000	...	244,000	
Spain	20,960,000	17	84	1.8	220,000	...	5,723,000	
Hungary	22,420,000	28	16	1.3				
Austria proper	23,990,000	32	7	1.0	...	3,670,000†	...	52,596,000†
Servia	2,390,000	20	...	1.0	15,000	... ...	731	
Rumania	5,030,000	17	47	1.0	...	60,000	...	877,000
Greece	2,080,000	16	80	0.9	35,000	...	633,000	
Luxemburg	190,000	30	...	0.9				
Switzerland	2,100,000	20	4	0.7	170,000	...	2,873,000	
Germany	34,490,000	26	33	0.7	4,600,000	...	72,174,000	
France	23,530,000	18	12	0.6	1,230,000	...	14,854,000	
Italy	10,110,000	14	4	0.3	420,000	...	6,088,000	
Denmark	600,000	6	24	0.2	470,000	...	6,088,000	
Great Britain	3,030,000	4	3	0.1	9,290,000	...	108,066,000	
Belgium	1,250,000	17	5	0.1	1,020,000	...	19,967,000	
Portugal	770,000	3	8	0.1	60,000	...	974,000	
Holland	570,000	7	...	0.1	180,000	...	3,506,000	
Turkey	6,180,000	8						
Total	758,080,000	31	...	2	17,760,000	15,130,000	245,667,000	
Net imports	...	...	...	...	...	...	101,126,000	

*Average data collected from the annual returns for 1896–1900, whenever available.
†Including Hungary, Bosnia, and Herzegovina.

Turning from the importing to the exporting countries of Europe, we find that in Norway about 1,400,000 tons of lumber are annually manufactured into paper-pulp. During the last ten years the amount exported has slightly fallen off, and all authorities are agreed that the Norwegian forests have been overworked. Only about 12 per cent. of the forest area is under Government control. In Norway and in Sweden the forests are situated in such a high latitude that growth is slow. In Sweden, however, one-fourth of the 48,000,000 acres of forest land is owned by the State and is under efficient State management. The cutting of trees less than 8 inches in diameter 5 feet from the ground is forbidden everywhere. The manufacture of paper-pulp and cellulose is rapidly increasing and annually consumes about 1,000,000 tons of coniferous timber. In Austria-Hungary about 20 per cent. of the forests are State owned. Much of the private forest land is overworked, and the Director-General of the State Forests has publicly stated that the standing crop of timber is some 30 per cent. below the quantity necessary to maintain a permanent annual cut as large as that at present taken out of the forests. As to the Russian forests, great difference of opinion prevails among experts. Monsieur Melard, French Inspector of Forests, in his pamphlet on *The Insufficiency of the Production of Timber in the World*, published June, 1900, states that Russia's surplus supply is being rapidly exhausted and that by the middle of the century she will have no more than is required for home consumption. On the other hand, the Director-General of the Russian State Forests affirms that the utilization of the Russian State forests is considerably below the annual growth, and Russia will, for a long time to come, be able to keep up its production. This refers only to the State forests, or 314,000,000 acres out of a total of 516,000,000. The private forests have been badly overworked in recent years. Moreover, much of the area put down as forest land is composed of swampy or other tracts where merchantable timber does not grow.

Considering, last of all, the lumber trade and timber-supply of Asia, Africa, Australia, and South America, we find that their annual imports exceed their exports ten times. (See accompanying table.) China and Egypt have little wood. The remaining importing countries have extensive unworked forests, especially Australia. Japan has her forests under systematic management and imports comparatively little. India exports teak and some furniture wood, and can do little more, since she has but 140,000,000 acres of forest land to supply a home population of about 300,000,000 people. The other regions export chiefly mahogany and other furniture woods.

It appears that the supply of hard and other tropical woods is abundant to meet the demands of the lumber trade for years to come, and that when the present sources of supply are exhausted, others may be opened in the unexplored regions of Central and South America and Africa. On the other hand, there seems to be danger that the supply of coniferous woods which constitute the bulk of the lumber trade may be speedily exhausted, not only in the United States, but also in the markets of the world. The main sources of an increased supply are Canada, Sweden, and Russia.

NET IMPORTS AND EXPORTS

COUNTRIES	Net imports	Net exports
	Tons	*Tons*
South America	330,000	
Egypt	200,000	
Australasia	160,000	
Cape of Good Hope	150,000	
Natal	50,000	
China	50,000	
Mauritius	20,000	
Ceylon	10,000	
Japan	5,000	
West Indies, Mexico, New Guinea, Honduras	....	13,000
West Coast, Africa	....	28,000
India	....	55,000
Total	975,000	96,000
Net imports	879,000	

BIBLIOGRAPHY. For statistics and general information on the lumber industry, consult: Schlich, paper on "The Outlook of the World's Timber Supply," published in the *Journal of the Society of Arts*, March 1, 1901 (London). See also the chapter on the "Lumber Trade," by Bernard E. Fernow, Chief of Division of Forestry, United States Department of Agriculture, in *One Hundred Years of American Commerce* (New York, 1895); the pamphlet by M. Melard, Inspector of Forests at Paris, on *The Insufficiency of the Production of Timber in the World* (Paris, 1900). Also "The Lumber Trade of the United States," in the *Monthly Summary of Commerce and Finance* for November, 1900, issued by the Bureau of Statistics at Washington; Articles on "Lumber," *Twelfth United States Census* (Washington, 1902). See FOREST; FORESTRY; WOODWORKING MACHINERY.

LUMBER STATE. Maine. See STATES, POPULAR NAMES OF.

LUMBRICOID (from Lat. *lumbricus*, intestinal worm + Gk. *εἶδος*, *eidos*, form). A nematode worm found as a parasite in the human intestine. It is a reddish-yellow worm from 8 inches to 16 inches in length, and nearly one-half inch in diameter, round, and with a tapering tail. It is transmitted to human beings without an intermediate host, the eggs which contain embryos being swallowed in drinking-water and resisting the action of the digestive fluids. It is generally harmless, though in some cases it has undoubtedly caused death by entering the bile-ducts and gaining access to the substance of the liver, the pancreatic duct, and even the air-passages, the Eustachian tubes, and the lachrymal ducts. A mass of eighty or one hundred of these worms has been found at one time in the small intestine. During a course of years thousands of worms have been passed *per rectum* by one victim. Reflex nervous symptoms have been caused by them in the majority of cases, and paralysis, convulsions, epilepsy, catalepsy, and tetanoid states have been attributed to them with great reason. Among the drugs used to procure expulsion of the roundworm are azedarach, santonin, spigelia, turpentine, mucuna, and chenopodium.

LUMINAIS, lụ'mé'nä', EVARISTE VITAL (1821-96). A French genre and historical painter, born at Nantes. He was a pupil of Cogniet and of Troyon in Paris, where he first exhibited chiefly spirited scenes from popular life in Brittany, such as "Breton Fair" (1847); "The Pirates" (1851); "Reading the Will" (1853); "Hunting for Sea Birds' Nests" (1855); and "Two Guardians" (1864). Afterwards he drew his subjects more frequently from the mediæval history of France, especially of the Merovingian period. Prominent among these are "Gallic Revenge" (1869); "Brunhild" (1874); "A Hunt Under King Dagobert" (1879); "The Last of the Merovingians" (1883); and "Death of Chilperic I." (1885). Several of his numerous productions are in the provincial museums of France, notably "Defeat of the Germans at Tolbiac" (1848) and "Return from the Chase" (1861), both at Nantes; "Gauls in Sight of Rome" (1870), at Nancy; and "Advance Guard" (1870), at Bordeaux.

LUMINOSITY OF ANIMALS (ML. *luminositas*, splendor, from Lat. *luminosus*, shining, from *lumen*, light, from *lucere*, to shine; connected with Gk. λευκός, *leukos*, white, Skt. *ruc*, to shine, OChurch Slav. *lucha*, moon, OIr. *lŏche*, lightning, OHG. *lioht*, Ger. *Licht*, AS. *lēoht*, Eng. *light*). The property possessed by many animals of giving off from the whole or part of their surface a light similar in appearance to that of phosphorescence. This light was at first supposed by many to be in some way due to the presence of phosphorus in the animal's tissue, and hence the name phosphorescence was first given to this kind of luminosity. Subsequent investigation has made it certain that phosphorus has nothing whatever to do with the phenomenon. This kind of light continues or is emitted only in the presence of oxygen. Fabre demonstrated that the luminous mushroom (Agaricus) gives off more carbonic-acid gas while luminescent than at other times, and Max Schultze has called attention to the fact that the photogenic cells of the lightning-bug are always found in close relation with the tracheæ. If these photogenic cells are placed near perosmic acid they draw oxygen from the acid. Radziszewski has studied the conditions under which chemical substances exhibit luminescence and has found that a whole series of substances emit light when they are permitted to combine with oxygen in an alkaline solution. Such substances are fats, ethereal oils, hydrocarbons, and alcohols, but heat is necessary with some of them for the production of light. Since in living tissue fats, oils, and the like are present, together with substances which give an alkaline reaction, the conditions that are essential for luminosity are present. Wielowiejski and Emery conclude that the photogenic substances exist in the cells of the luminous organs, and may be in the nature of fats, while Dubois, from his studies on Pyrophorus, considers the light to be due to two substances, 'luciferase' and 'luciferine.' Luciferase he believes to be in the nature of an enzyme which exists in the form of minute granules. The second substance exists in the blood and becomes luminous only when it is borne into the luminous organ. Watasé believes the photogenic material to be the product of secretion of the cell, formed as the result of metabolism in the cell, and in the process of its formation identical with that known as secretion. He says further that the process of secretion does not necessarily imply the existence of a gland; the fundamental process of secretion may be carried out by an isolated single cell just as well as by thousands of similarly constituted gland-cells. For the luminous apparatus of deep-sea fishes, see Lantern-Fish and the accompanying plates.

The emission of light by living substances is widespread. It is an especially significant fact that, of the wonderful pelagic animals whose delicate transparent bodies occupy the upper strata of the sea and float about as plankton, almost all possess luminous power. Associated with this fact is the presumption that the luminous capacity of living substances is possibly much wider spread than is realized, that we do not see the light because the organisms are not transparent, or because the production is too feeble to allow the light to be seen through thick body-layers; indeed, it is not impossible that in our own bodies certain cells may be photogenic. In most cases, as in luminous insects, Verworn says, the power of emitting light is a peculiarity specially perfected by selection, and possesses its own significance for the life of the animals in question. In pelagic marine animals, also, such a significance is certainly present; as a rule, these animals emit light suddenly and only upon stimulation, and hence it may be supposed that the light serves as a means of frightening enemies.

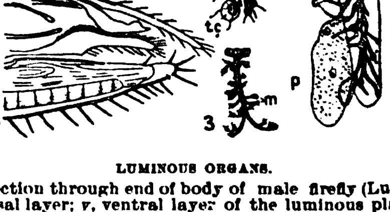
Luminescence is a phenomenon common both to animals and plants. Thus certain bacteria that live in sea-water, or those of putrefaction, such as *Bacterium phosphorescens*, which lives on dead flesh, cause luminescence. At least two kinds of these bacteria are known to produce a blue light, and one a greenish light. It is easy to make artificial cultures of these forms so as to study their growth and activities. Certain mushrooms of the genus Agaricus, which grow upon wood and cause its decomposition, are also luminescent. The blossoms of nasturtium, marigold, poppy, and other plants, and even the leaves, have been observed to emit light occasionally. Possibly the light in the latter cases is of electrical nature.

According to the way in which their luminescent powers are used, animals may be divided, according to Watasé, into three groups: (1) The photogenic substance is thrown out of the body and becomes luminous when it comes in contact with the oxygen of the air or water; this substance may be liquid as in the case of Pholas and copepods, or fine granules as in Chætopterus, earthworms, and myriapods. (2) In the second class, the photogenic material is never thrown out of the body. Oxidation is accomplished by the oxygen which is taken in with the air or the blood, as in the case of fireflies and glowworms. Such organisms can usually control their luminescence. (3) In the third group there are no special photogenic organs. The light-giving material, however formed, accumulates along the course of muscle-fibres or other contracting organs and emits scintillating light at the time of protoplasmic contraction. In such forms as the Noctiluca, luminescence seems to occur in myriads of fine points. In this form, too, myriads of fine strands of protoplasm are continually expanding and contracting throughout the protoplasm of the animal. Heat and light are variations of the same radiant energy. They differ in degree, but not in kind. Hence the heat and light producing particles in these luminescent organisms may be very similar. They may simply be variations of the same chemical substance. Infusoria, rhizopods, polyps, medusæ, echinoderms, annelids, tunicates, mollusks, crustaceans, myriapods, and insects all have luminescent species. Noctiluca, one of the most brilliant, is an infusorian which occurs in certain parts of the ocean in prodigious numbers. Jellyfishes, ctenophores, and the tunicate Pyrosoma give out a considerable volume of glow when irritated. Scolopendra among myriapods, and beetles, gnats, and May-flies among insects, are luminous in air. Among insects there is a larva of a New Zealand fly (*Boletophila luminosa*) which emits light. Gnats of the family Chironomidæ are sometimes entirely luminous with the exception of the wings.

A case is recorded by Kane in his last voyage to the polar region of human luminescence, and a few other cases have been recorded by several good authorities where, especially a short time before death, the human body had a luminous appearance. It is interesting to note in this connection that the "steady and permanent brilliancy of Noctiluca denotes approaching dissolution."

The light produced by protoplasm is the most economical light known, for all the energy is converted into light, so that there is no loss in the form of heat or chemical rays. Langley and Very compared the light of insects with that of the sun by superimposing their spectra and found that the spectrum of the sun, with equal luminosity, extends farther both toward the violet and the red ends of the spectrum, but the light of the Pyrophorus is more intense in the green region than sunlight. Hence both the heat-rays (the red) and the chemical rays (the blue) are practically absent from the spectrum of Pyrophorus.

Among insects, besides the well-known fireflies (Lampyridæ), luminosity is confined to a few other beetles, as certain Elateridæ (Pyrophorus), an Indian buprestid (*Buprestis ocellata*), and a telephorid larva. The so-called phosphorescence of insects and other animals is a greenish scintillating or glowing light. The seat of the light is the intensely luminous areas situated either in the abdomen (Lampyridæ), or in the thorax (Pyrophorus). Each is a specialized portion of the fat-body, being a plate consisting of polygonal cells, situated directly under the integument,



LUMINOUS ORGANS.

1. Section through end of body of male firefly (Luciola): *d*, dorsal layer; *v*, ventral layer of the luminous plate; *s*, skin. 2. Ventral layer isolated; *tr*, trachea; *p*, parenchyme cell; *c*, capillary trachea; *m*, coagulum. 3. A tracheal stem. 4. A part of No. 3, more highly magnified. (After Emery.)

and supplied with nerves and fine tracheal branches.

Lang says that the cells of this luminous organ secrete, under the control of the nervous system, a substance which is burned during the appearance of the light; this combustion takes place by means of the oxygen conveyed to the cells of the luminous body by the tracheæ, which branch profusely in it and break up into capillaries. Emery states that the males of Luciola display their light in two ways. When at nighttime they are active or flying the light is given out at short and regular intervals, causing the well-known sparkling or scintillating light. Luciola flying in the daytime, or injured, gives out a tolerably strong light, though not nearly reaching the intensity of the sparkling light. In this case the light is constant, yet the phosphorescent plate is not luminous in its whole extent, but glows at different places as if phosphorescent clouds passed over it.

As to the use to the animal of this luminosity, it is generally supposed to allure the females, but Emery thinks it is a means of defense, or a warning or danger-signal against insectivorous nocturnal animals, such as bats, since when crushed the firefly (Luciola) emits a disagreeable cabbage-like smell, though it has no acrid taste. The eggs of fireflies are luminous, but this is probably due to portions of the fat-body cells accidentally adhering to the outside of the egg. The larvæ are luminous at different ages, while the position of the luminous organs changes with age. In the larva of Pyrophorus before molting the light apparatus is situated only on the under side of the head and prothoracic segment. In larvæ of the second stage there are added three shining spots on each of the first eight abdominal segments, and a single luminous spot on the last segment. In the adult beetles there is a luminous spot on the under side of the first abdominal segment, but the greatest amount of light is produced by the vesicles on the hinder part of the prothorax (Dubois).

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LUMINOUS PAINT. A phosphorescent substance that may be used for illuminating street-plates, buoys, clock-dials, etc. After being exposed for some time to ordinary light, the paint will for many hours emit a violet light in the dark. Luminous paint for use on paper may be made by dissolving 10 parts (by weight) of pure gelatin in 40 parts of hot water, then adding 1 part of glycerin and 30 parts of phosphorescent powder. The latter is obtained by heating pure sulphide of calcium and mixing it with a small quantity of bismuth salt. The paint will withstand exposure if 2 parts of the phosphorescent powder are mixed with 3 parts of a colorless varnish; an additional coating of varnish may serve for further protection. See Phosphorescence.

LUMMI, lụm′mē. A Salishan tribe, formerly occupying the coast of Puget Sound between Skagit and Nooksak rivers, northern Washington. They entered into treaty with the Government in 1855 and have since been gathered upon a small reservation within their original territory. They were converted by Jesuit missionaries and are now all civilized, living in houses and wearing citizen's dress. They number about 320.

LUM′MIS, Charles Fletcher (1859—). An American author, born in Boston. He graduated from Harvard University in 1881, and during the two following years edited a newspaper in Cincinnati. He lived five years in New Mexico, and traveled in Mexico and South America. He was editor of the Los Angeles *Daily Times* (1885-87), and afterwards of the *Land of Sunshine*, a Los Angeles magazine, succeeded by *Out West*. His works include: *A New Mexican David* (1891); *A Tramp Across the Continent* (1892); *The Spanish Pioneers* (1894); *The Man Who Married the Moon, and Other Pueblo Indian Folk-Stories* (1894); *The Gold Fish of Grand Chimú* (1896); *The Enchanted Burro* (1897); and *The Awakening of a Nation* (1898).

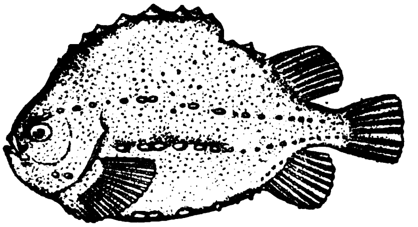
LUMPFISH. See Lumpsucker.

LUMP-JAW. A disease of domestic animals, particularly of cattle. See Actinomycosis.

LUMP′KIN, Joseph Henry (1799-1867). An American jurist, born in Oglethorpe County, Ga. After graduating at Princeton, he was admitted to the bar in 1820, but in 1844 was compelled by ill health to retire. In 1845 he became associate justice of the State Supreme Court, and soon afterwards was elected Chief Justice, a position which he held until his death. He was the founder of, and was a professor in, the Lumpkin Law School, attached to the University of Georgia.

LUMPKIN, Tony. The awkward son of Mrs. Hardcastle, in Goldsmith's *She Stoops to Conquer*. He is ignorant and conceited, given to rough practical jokes.

LUMPSUCKER (so called from the awkward shape of the fish, and its adhering power), or Lumpfish. An uncouth fish of the family Cyclopteridæ, formerly Discoboli), oval in shape, and with the skin studded with conical bony tubercles. The fins are short and the ventrals unite to form a sucking-disk which can take hold of an object so firmly that several times the weight of a fish may be raised by lifting the fish after it has made an attachment. (See Illustration under Sea-Snail.) In the breeding season the male puts on exceedingly rich colors—purple and blue above, orange-red below, in many tints. It is numerous on both sides of the North Atlantic, where it stays about rocky shores, clinging to the bottom, moving slowly, and preying on smaller fishes, crustaceans, etc. It spawns near shore in spring, after which the female retires to deep water, leaving the male to watch over the eggs, which he is said to defend with great courage. The flesh is eaten by some persons, though nowhere highly esteemed, as it is soft and oily. Local names for this species in Great Britain are 'lumpfish' and 'cockpaiddle.' Several other species are known in various parts of the world. Consult: Goode, *Fishery Industries*, section i. (Washington, 1884); Garman, *Monograph of the Discoboli* (Cambridge, 1892).



LUMPSUCKER.

LUNA (Lat., moon; connected with Lat. *lucere*, to shine). The moon, worshiped as a goddess by the ancient Romans; the Selene (Σελήνη) of the Greeks. Her culture goes back to the primitive times of Italic nature-worship. She had three temples in Rome: one on the Aventine overlooking the Circus Maximus, the construction of which is assigned to King Servius Tullius; a second, smaller, on the Palatine, kept illuminated at night; and a third, a mere shrine, close to the Circus Maximus itself. In Greek mythology, Selene is the sister or wife of Helios, the sun.

LUNA, lo͞o′nȧ, Alvaro de, Count de Gormas (1388-1453). A Spanish courtier. He was at first a page at the Court of Castile, but rose to be the favorite Minister of King John II., and (1423) Constable of the Kingdom. Through the machinations of the grandees, he was twice banished—in 1427 and again in 1439. In 1445 he became commander-in-chief of the army; but his fall was finally brought about by an intrigue, and he was arrested at Burgos, condemned to death, and executed at Valladolid.

LUNA, Pedro de (1334-1424). Antipope, under the name of Benedict XIII. He was a native of Spain and received a cardinal's hat from Gregory XI. (1375). On the death of the Antipope, Clement VII., in 1394, he was elected Pope by the Avignon cardinals, on condition that he should resign at the request of the College of Cardinals, or whenever the Pope at Rome should resign, so that a new Pope might be chosen and the great schism ended. This he steadily refused to do, although he was deposed by the Council of Pisa in 1409 and by that of Constance in 1417. After the election of Martin V., he withdrew to the fortress of Peñíscola, in Valencia, and continued in schism till his death. See Schism, Western.

LUNACY (Disease). See Insanity.

LUNACY (from Lat. *luna*, moon) (in Law). When an insane person becomes so incompetent mentally as to be unable to care properly for his own person or property, or as to be dangerous to the persons or property of others, it becomes the right and duty of the State to assume control over his person or property, or both, and when that is done his condition is technically known as lunacy. In England the King, as *parens patriæ*, was regarded as the natural guardian and protector of all legally incompetent persons within the realm. The execution of this duty was early delegated to the Chancellor, and the Court of Chancery thus became the tribunal to which belonged jurisdiction over such unfortunates and their property. As this jurisdiction of the Chancellor was not exercised by him primarily in his judicial capacity, it has been questioned whether courts of equity in the United States have this portion of the Chancellor's jurisdiction. The question is now unimportant, as all of the United States now have elaborate systems for the control and care of lunatics and their property, created and regulated entirely by statute.

So long as a person is not judicially declared incompetent he is entitled to his liberty and to manage his own affairs. At common law a private person might temporarily restrain such an insane person to prevent an immediately threatened injury to the insane person or others, but for any other or further restraint he was liable in damages for assault or false imprisonment; and an early English statute made it a misdemeanor for one to receive two or more insane persons into his house for care or treatment unless the house was registered under the act as an asylum for the insane. When a legal investigation was to be made for the purpose of having one judicially declared a lunatic it was the Chancery practice (which has been perpetuated with slight modifications by statute) to issue an order or decree, upon the petition of a relative of the lunatic or of a proper public officer, appointing a commission *de lunatico inquirendo*—to inquire as to the lunacy of the person named in the order. The commission is usually, although not always, composed of a layman, or in some States of a lawyer, a physician, and a layman; and it is its duty to listen to evidence upon the question of insanity, and to determine, in some States with the aid of a jury, the question of legal competency. Generally notice is required to be given to the lunatic, and sometimes to his relatives or the person with whom he resides; and unless dangerous he must be given opportunity to appear before the commission and be heard in his own defense, failing which his constitutional right not to be deprived of liberty without due process of law would be violated. Upon the report of the commission that the person named in the order appointing the commission is a lunatic, the Chancellor, or the court having corresponding jurisdiction, adjudges him to be a lunatic, and appoints a committee, or in some States a guardian, to take charge of the lunatic's person and property, or it may in its discretion appoint separate committees as guardians of the person and property respectively. The lunatic then ceases to have most of the attributes of a legal person. He has no power to contract or in any way dispose of his property by deed or will. He is liable upon theory of quasi-contract for his necessaries. He is still liable for torts, and may sue and be sued, although generally all litigation must be carried on in the name of his committee. The committee or guardian of the property has very limited power over the property, being merely the bailiff or receiver of the court acting under its direction. The income of the lunatic's property may be used for his maintenance, but in general the committee may sell it only upon order of the court, and then only for the lunatic's maintenance or for the purpose of reinvestment. The committee of the person of the lunatic has general charge of and control over the person of the lunatic, and may cause him to be confined in such asylum as is authorized by law to receive and care for lunatics. It is now the universal practice to regulate by statute the care of the incompetent insane, and to permit their confinement only in places designated by law and subjected to the frequent inspection of State lunacy commissioners or corresponding officials. If one is improperly restrained of his liberty on the ground of insanity, he may resort to the writ of *habeas corpus;* and in some States he has a statutory right to a writ *de lunatico inquirendo.*

The functions of the committees or guardians both of the person and the property cease upon the death of the lunatic, or upon the return of his sanity when judicially determined. They may also be discharged from their duties by order of the court for cause, or whenever they ask upon reasonable grounds to be relieved of their duties; and it then becomes the duty of the court to appiont a new committee or guardian. See INSANITY.

Consult: Rodger, *Domestic Relations* (Chicago, 1899); Browne, *Domestic Relations* (2d ed., Boston, 1890); Archibald, *Lunacy Procedure* (4th ed., London, 1895); Elmer, *Practice in Lunacy* (7th ed., London, 1892); M'Adam, *Insanity and Lunacy* (New York, 1895); Pope, *Law of Lunacy* (London, 1890); Reuton, *Law and Practice of Lunacy* (London, 1896). For law of insanity and lunacy with reference to contracts, consult the authorities referred to under CONTRACTS. For the law of insanity with reference to wills, consult the authorities referred to under WILL. For the law of insanity and lunacy with reference to crime, see, particularly, Bishop, *New Criminal Law* (Chicago, 1892); Wharton, *Criminal Law* (9th ed., Philadelphia, 1885), and the authorities referred to under the title CRIMINAL LAW. See also the authorities referred to under the title MEDICAL JURISPRUDENCE.

LUNALILO, lo͞o'nȧ-lē'lō, WILLIAM C. (1835-74). A king of the Hawaiian Islands. On the death of Kamehameha V., the people chose Prince Lunalilo to be King, in January, 1873. After a brief reign, which was marked only by a growing feeling of race hatred and by the mutiny of his household troops, he died at Honolulu on February 3, 1874. He was succeeded by David Kalakaua.

LUNA MOTH (so called from the luniform eye-spots). One of the largest and most beautiful of the American moths (*Tropæa luna*), whose wings expand five inches. It is light green in color, with a purple-brown band along the front margin of the anterior wing, and an eye-spot on each wing consisting of a transparent centre and rings of white, yellow, blue, and black. The posterior wings are prolonged into two long tails. The caterpillar, when full grown, is three inches long, and is pale bluish green with a pearl-colored head, a pale yellow stripe along each side of the body, and a transverse yellow line on the back between each two abdominal segments. It feeds on black walnut, hickory, beech, oak, maple, and other forest trees. The cocoon is usually inclosed in leaves, and is not so compact as that of the polyphemus moth (q.v.); it is either spun on the ground or falls there with the autumn leaves. The moth emerges the following summer, and there is only one generation each year.

LUNAR CAUSTIC. Fused nitrate of silver when cast into cylinders smaller than a slate pencil. It is white or pale gray when freshly prepared. Exposure to the air blackens and decomposes it, and when applied to the healthy skin it leaves a disagreeable mahogany-colored stain which later turns black.

It is used locally in surgery for its antiseptic, hemostatic, astringent, caustic, and stimulant properties. Spongy or exuberant granulations (popularly known as 'proud flesh') are destroyed by it; indolent ulcers, sores, sinuses, and cracked and fissured skin are healed by it. It may be applied to the site of a wart which has been scraped away. It is an excellent application for fissured nipples, for trachoma, and for mucous patches of mouth and throat. Nitrate of silver mixed with nitrate of potash and molded like lunar caustic forms the 'mitigated stick' or *argenti nitras dilutus.* This is employed when a less severe action is desired.

LUNAR CYCLE. See METONIC CYCLE.

LUNAR THEORY. A theory dealing with the disturbances in the moon's orbit produced by the other heavenly bodies which attract the moon. Of these, the sun is the only one that affects the moon directly. The planets also act upon the moon, but their mass is too small and their distances too great to produce any sensible effect. They do, however, disturb the earth in her orbit, and so in an indirect way affect the moon. The fact that the earth is not a perfect sphere produces also a few disturbances.

The lunar theory is the most difficult part of mathematical astronomy, and is still incomplete, involving as it does the 'Problem of the Three Bodies' (q.v.). The three bodies are the moon, the earth, and the sun. The sun's mass is 330,000 times that of the earth, and its distance 389 times that of the moon from the earth. Since the attraction of one body on another varies directly as the mass and inversely as the square of the distance, the sun's attraction on the moon equals $\frac{330000}{389^2} = 2.18$ times that of the earth. Thus the sun's attraction is more than twice as great as that of the earth, and if both were fixed in space the sun would naturally pull the moon away from the earth. Since this is not the case and the sun attracts the earth almost as much as it does the moon, the result is that both fall toward it, combining this motion with that in the orbit.

At new moon the moon is nearer the sun than at any other place in the orbit, and the sun's attraction is then the greatest. Therefore, at new moon the curvature of the moon's orbit toward the earth is diminished, while at quadrature (q.v.) it is increased. It is convenient to resolve the disturbing force of the sun into three components, the *radial, tangential,* and *orthogonal.* The effect of the radial component is to draw the moon toward or away from the earth. This force is a maximum at syzygies and quadrature, and vanishes whenever the disturbing force becomes perpendicular to the radius, which happens at 54° 44′ on each side of line of syzygies. It is negative more than half-way round. The effect of this is to lessen the earth's attraction for the moon by nearly 1/360 and to increase its mean distance. This makes the month about an hour longer than it would be otherwise.

The diminution of the earth's attraction for the moon at apogee (q.v.) and the reverse of this at perigee (q.v.) causes an oscillation of the line of apsides (q.v.). The disturbing force at apogee, however, predominates, and the line of apsides completes a revolution in about nine years.

The tangential component retards and accelerates the motion of the moon. This is the main cause of an inequality, called the variation. Its maximum amount is 39′ 30″, and this is attained half-way between the syzygies and quadrature. The orthogonal component tends to draw the moon toward the ecliptic. This causes the inequality known as the regression of the nodes (q.v.), which complete a revolution in about nine years. This force vanishes twice a year when the sun is at the nodes of the moon's orbit, since then they are both in the same plane.

Evection is another disturbance which puts the moon forward or backward in the orbit about 1¼°. It has a period of about 1⅛ years, the time required by the sun to pass from the line of apsides to the same line again. The cause of this inequality is the increase and decrease of the eccentricity in the moon's orbit, caused by the increase and decrease in the earth's attraction on the moon.

The annual equation is an inequality produced by an increase in the sun's disturbing force, when the earth is nearer to the sun than its mean distance. As a result of this the month is lengthened or shortened, depending upon whether the increased disturbing force aids or retards the motion of the moon.

The secular acceleration of the moon's mean motion was discovered by Halley by comparing ancient and modern eclipses, and the moon is believed to have gained in this way one degree during the Christian Era. Laplace (q.v.) explained this secular acceleration by the fact that the earth's orbit, under the action of other planets, is growing less eccentric. As a result of this the average disturbing force of the sun is diminished, and the month is shortened little by little. The period of this inequality is 25,000 years.

Of these irregularities, evection is the only one which was known to the ancients. It may affect the time of an eclipse by nearly six hours, and was discovered by Hipparchus (B.C. 150) while observing an eclipse. The variation was discovered by Tycho Brahe. This does not affect the time of an eclipse, and therefore escaped the Greek astronomers. The inequalities mentioned above are only the principal ones. In the computation of nautical almanacs, about 70 are taken into consideration for determination of longitude, and half that number for latitude. See MOON. Consult Chauvenet, *Spherical and Practical Astronomy* (Philadelphia, 1863).

LUNATIC. In law, a person who was originally possessed of a sound mind, but whose reason has become so clouded and deranged that he cannot be held legally accountable for his acts. Most authorities hold that a lunatic is one who has become entirely bereft of reason, and classify under various other terms the different phases of mental unsoundness which may influence a person's legal relations. For example, *monomania* usually consists of an abnormal aversion to a single thing or person, and may be so violent as to pervert entirely the victim's judgment as to the object of his delusion, and this must be taken into account by the law; but such a person can hardly be called a lunatic if his other reasoning faculties seem normal. A lunatic cannot be held for a criminal act, as he cannot distinguish between right and wrong; his contracts are voidable; he cannot make a valid disposition of his property by will, and he should be represented by a committee or guardian for all legal purposes. A lunatic may have a lucid interval (q.v.) during which he is legally competent. See *Redfield on Wills;* Ordronaux, *Jurisprudence of Medicine;* also LUNACY.

LUNATIC ASYLUM. See INSANE ASYLUM.

LUND, lo͝ond. An episcopal city of Sweden, situated 5 miles from the Sound, 11 miles northeast of Malmö (Map: Sweden, E 9). Its cathedral, which is the largest and most beautiful Romanesque building in Scandinavia, dates from the twelfth century. Near it are the university buildings, including the historical museum. The university has faculties of theology, law, medicine, and philosophy; was founded in 1666, and is attended by some 650 students. The chief industries of the town are sugar-refining and the manufacture of machinery. Population, in 1901, 16,621. In the Middle Ages Lund was long the largest city of Scandinavia. In the eleventh century it was the seat of a bishopric, which in 1104 was erected into an archiepiscopal see. The Archbishop of Lund claimed jurisdiction over all the sees of Scandinavia. Lund was often the residence of the Danish kings. The town suffered during the wars between Sweden and Denmark, and passed from the possession of the latter in 1658. Here the treaty of peace was signed in 1679 by which Skåne was permanently confirmed as a part of Sweden.

LUND, lụnd, TROELS FREDERIK (1840—). A Danish historian, born at Copenhagen. He was appointed professor at the Military School of Fredericksburg. His publications include an important work on Scandinavian history, *Danmarks og Norges Historie i Slutningen af det 16de Aarhundrede* ("History of Denmark and Norway to the End of the Sixteenth Century") (1880-92).

LUNDA, lụn'dȧ. Bantu peoples living north of Lake Bangweolo, British Central Africa. They are tall, well proportioned, with regular features, and a complexion lighter than among other tribes of the Bantus. They depend on agriculture and trade in ivory and slaves. They file the teeth, tattoo themselves, and smear the body with oil. All travelers agree that the Lunda are a mild, inoffensive people, remarkable in Africa for the deference they show to their women.

LUNDGREN, lo͝ond'grĕn, EGRON SELLIF (1815-75). A Swedish water-color painter. He was born at Stockholm, December 18, 1815. He studied at the Academy of Stockholm, and afterwards in Paris under Cogniet. He sojourned in Italy, 1841-49, devoting himself to water-colors. From there he went to Spain and then to England, where he was commissioned by Queen Victoria to paint ceremonial pictures. He was sent to India during the war in 1858, the results of which expedition were a series of five hundred sketches, including numerous portraits. His best works include "San Vitale, Ravenna," and the "Library, Siena," both in the National Museum, Stockholm; "Feast of Corpus Domini in Rome" (1841), Royal Palace, Stockholm; and a series of illustrations to "Old Swedish Tales" (1875).

LUN'DY, Benjamin (1789-1839). An American anti-slavery agitator, born of Quaker parentage at Hardwick, Warren County, N. J. At the age of nineteen he went to Wheeling, on the Ohio, where he worked as a saddler's apprentice. The town was a great thoroughfare for the slave trade, and Lundy's indignation was quickly aroused against the whole slave system. His apprenticeship completed, he married, and, settling in Saint Clairsville, Ohio, soon built up a profitable business. It was not long before he organized 'The Union Humane Society,' which soon numbered nearly five hundred members. In 1819 he went to Missouri in the hope of strengthening the opposition to the admission of the Territory as a slave State, where he wrote a number of articles exposing the evils of slavery and the wickedness of its extension. After losing nearly all his property, he returned to Ohio in 1821 and began the publication at Mount Pleasant of the *Genius of Universal Emancipation*, which he shortly afterwards removed to Jonesborough, Tenn., and then again, in 1824, to Baltimore, Md. In 1825 he visited Haiti in search of a refuge for emancipated blacks, and four years later made another voyage to that country for the same purpose. Two years later he was brutally assaulted by a Baltimore slave-dealer enraged over an article in the *Genius*. In 1828 he journeyed on foot through the Eastern States, and made forty-three public addresses. In the fall of 1829 William Lloyd Garrison (q.v.) joined Lundy in Baltimore as assistant editor of the *Genius*. The two were alike in their hostility to slavery, but Garrison was an advocate of immediate emancipation on the soil, while Lundy was committed to schemes of colonization abroad. Within a few months, while Lundy was absent in Mexico, Garrison published extremely radical articles demanding immediate emancipation and asserting that the domestic slave trade was as piratical as the foreign. Garrison was brought to trial for criminal libel, and fined and imprisoned. This occurrence so reduced the circulation of the *Genius* that a friendly dissolution of partnership between Lundy and Garrison took place. It also raised up such a hostile spirit in Baltimore that Lundy shortly afterwards removed the paper to Washington, where, after some years, it failed. In the winter of 1830-31 Lundy visited the Wilberforce colony of fugitive slaves in Canada. In the following two years he made two trips to Texas in an attempt to secure an asylum for negroes under the Mexican flag. In 1836 he started the *National Inquirer* in Philadelphia, but retired from it in 1838. In the latter year almost all his possessions, which were stored in Pennsylvania Hall, Philadelphia, were destroyed by a mob, which burned the building. In the following winter he removed to Lowell, Ill., where he reëstablished the *Genius of Universal Emancipation;* but after issuing a few numbers he was seized with a fever, and died August 22, 1839. Consult Earle, *Life, Travels, and Opinions of Benjamin Lundy* (Philadelphia, 1847).

LUNDY ISLAND. An island of Devonshire, England, situated at the entrance to the Bristol Channel, about 9 miles from the mainland (Map: England, B 5). It has an area of over 900 acres; there is a lighthouse. Population, about 180.

LUNDY'S LANE, Battle of. A battle fought along a roadway known as Lundy's Lane, about 1½ miles from Niagara Falls, on the Canadian side, on July 25, 1814, between an American force under the command first of General Scott and then of Gen. Jacob Brown, and a greatly superior British force under the command of General Riall. On the afternoon of the 25th General Brown, stationed with the American army at Chippewa, ordered General Scott, with about 1300 men, to advance toward Queenstown. The movement began between five and six o'clock, and after marching for about 2½ miles General Scott came upon a British force posted along Lundy's Lane. He immediately decided to attack. Major Jesup, commanding the American right, turned the British left, capturing a number of prisoners, including General Riall, but the American centre and left were less successful, though they held the greater part of their ground against superior numbers. Before nightfall General Brown arrived with reënforcements, and the fighting continued until some time after dark, little material advantage having been gained on either side excepting the capture of a strong battery by the Americans under the immediate command of Col. James Miller. Generals Brown and Scott having been wounded, the command of the Americans devolved on Gen. E. W. Ripley, who, after holding possession of the field for about an hour, retired to the original American encampment. The British force, including reënforcements which arrived during the battle, numbered altogether about 4500 men; that of the Americans about 2600. The American loss was 171 killed, 571 wounded, and 110 missing; while the British lost 84 killed, 559 wounded, and 235 prisoners. The battle is also known as the battle of Bridgewater and the battle of Niagara.

LUNE, Quadrature (Area) of. See Mensuration.

LÜNEBURG, lų'ne-bōōrk. An ancient town of the Province of Hanover, Germany, situated on the Ilmenau, a tributary of the Elbe, about 30 miles southeast of Hamburg (Map: Prussia, D 2). It is mediæval in appearance, with its narrow streets, ancient buildings, and a portion of its walls. Its churches are of considerable architectural interest, notably that of Saint John (fourteenth century), purely Gothic in style with a lofty tower, that of Saint Nicholas (1409), and that of Saint Michael (1367-1418), with the tombs of the princes of Lüneburg. The Rathaus in the market-place consists of a number of buildings constructed from the thirteenth to the eighteenth century, and containing fine examples of ancient wood-carving and glass-painting.

The educational institutions include a gymnasium, a seminary for teachers, and a library of 34,000 volumes, including many incunabula. Lüneburg has been noted since ancient times for the deposits of limestone, gypsum, and salt in its vicinity. It still produces the last two products on a large scale. It has manufactures of chemicals, fertilizers, carpets, iron wares, etc. The trade is chiefly in agricultural products. Population, in 1890, 20,665; in 1900, 24,693, largely Protestants. The town gives its name to a large tract of moorland known as the Lüneburger Heide.

Lüneburg was a flourishing place in the Middle Ages. It emancipated itself from the rule of the dukes of Lüneburg (see BRUNSWICK, HOUSE OF), became an influential member of the Hanseatic League, and at the time of the Reformation was one of the richest towns of North Germany. In the first half of the seventeenth century the city lost its independence, being brought under the sway of the dukes of Brunswick-Lüneburg. It subsequently shared the fortunes of Hanover.

LUNENBURG, lo͝o'nen-bûrg. A seaport of Nova Scotia, the capital of Lunenburg County (Map: Nova Scotia, E 5). Settled in 1753 by Germans, it retains a distinct Teutonic character. It has a capacious and well-sheltered harbor, ship-building yards, a large fishing-fleet, and considerable trade with the West Indies in lumber and fish. The United States is represented by a consular agent. Population, in 1891, 4898; in 1901, 2916.

LUNETTE (Fr., little moon). (1) In fortification, a small work beyond the ditch of the ravelin, formed at the reëntering angle made by the ravelin and bastion. (See FORTIFICATION.) (2) In architecture, the semicircular aperture or surface formed by the intersection of a tun-vault by another vault or a wall. If an aperture it is closed with glass, and when a surface it is often decorated with mural painting.

LUNÉVILLE, lụ'nȧ'vêl'. A town in the Department of Meurthe-et-Moselle, France, on the Meurthe, 20½ miles by rail southeast of Nancy (Map: France, N 3). The Church of Saint Jacques (1730-45), decorated with frescoes and wood-carvings, is worthy of notice. The former palace of the dukes of Lorraine (1703-06) was extended by Stanislas Leszczynski, the ex-King of Poland, and is now used as barracks, and its gardens have been converted into promenades. The town has a college and a library and a museum in the town hall. The chief products are faïence, linen, machinery, wagons, leather, gloves, etc. The trade is in agricultural products, wine, and local manufactures. Population, in 1891, 21,542; in 1901, 23,269. At Lunéville, February 9, 1801, Austria and the German Empire concluded a peace with France. The war which this treaty ended had begun in 1799, after the departure of Napoleon for Egypt, and is known in history as the 'War of the Second Coalition,' England, Austria, Turkey, Russia, Portugal, and Naples all having combined against France. At first the Allies were successful, but after Napoleon's return the Austrians were decisively defeated on June 14, 1800, by Napoleon himself at Marengo, and on December 3d by Moreau at Hohenlinden. The Emperor Francis thereupon accepted the Peace of Lunéville, which was based on that of Campo-Formio (q.v.). Germany west of the Rhine was relinquished to France, and an important change ensued in the composition of the German Empire through the secularization of ecclesiastical States and the incorporation of free cities with the hereditary principalities. These changes in the Empire were not consummated until 1803, when the Imperial Delegation published its conclusions. The Rhine from source to mouth was made the boundary of France. The independence of the Batavian, Helvetic, Cisalpine, and Ligurian republics was recognized; Austria was guaranteed the possession of Venetia as far as the Adige, which became the boundary of the Austrian possessions in Northern Italy; the Grand Duke of Tuscany lost his land to the Duke of Parma; the Duchy of Modena was annexed to the Cisapline Republic, its ruler receiving the Breisgau in exchange. The princes dispossessed on the left bank of the Rhine were to be indemnified by the secularization of ecclesiastical lands on the right bank. The treaty was signed by Francis II. both as sovereign of Austria and as head of the Holy Roman Empire, though, by the fundamental law of the Empire, the Emperor could not bind the electors and States of Germany without their previous consent. Consult Sloane, *Life of Napoleon Bonaparte* (New York, 1896).

LUNG, lo͞ong (Chin., dragon). The chief of the four supernatural beasts of Chinese legendary lore, and of the 360 species of scaly reptiles. As usually represented the lung has a scaly, serpentine body, with four feet armed with long claws, a bearded scowling head, straight horns, a line of bristling dorsal spines, and flames proceeding from its hips and shoulders—the usual mark of a supernatural animal. Originally it was represented with three claws, but the number has been increased, the Imperial dragon of the present dynasty having five. This is the kind usually embroidered on the Emperor's robes, and represented on the porcelains, etc., made for Imperial use. In Japan the Imperial dragon has only four claws. The Emperor's throne is called the 'dragon-throne;' his face is spoken of as the 'dragon-countenance;' the Imperial flag has a dragon on an imperial yellow ground, and is styled the 'dragon-banner,' and when the Emperor dies he is borne 'on high' by dragons. The dragon has the power of rendering itself visible or invisible, and may become at will as small as a silkworm, or assume such proportions as to fill the universe. There are many different kinds of lung: the 'celestial dragons,' which guard the mansions of the gods; 'spiritual dragons,' which rule the winds and produce rain; 'earth-dragons,' which direct the flow of rivers and springs. There is also a Buddhist 'dragon of the law,' which is represented as firmly grasping the 'jewel of the law' in its outstretched paws; and on old bronzes, as well as on porcelains and other objects, an archaic dragon called *Chih-lung* is sometimes found. It is lizard-like, has no claws on its feet, but has a spiral bifid tail. In art the 'celestial dragon' is usually represented as moving rapidly through the clouds in pursuit of an effulgent jewel from which flames issue as it whirls through space, and which is supposed to be possessed of great magic efficacy. It was a yellow dragon which rose out of the river Loh in ancient times and presented to the view of Fuh-hi (q.v.) the mystic symbols which form the *pa-kwa* or 'Eight Diagrams.'

LUNG. See RESPIRATION, ORGANS OF.

LUNGARNO, lo͞on-gär'nô (It., along the Arno). The name given to the interesting streets bordering the Arno on either side at Florence. The different parts bear various names, the best known being the Lungarno Acciajuli, between the Ponte Vecchio and the Ponte S. Trinità, a section of jewelers. The same name is given to corresponding streets at Pisa.

LUNG-CHOW, lụng′chou′. A walled town in the Province of Kwang-si, China, situated at the confluence of the Sung-chi and the Kao-ping rivers, a short distance from the frontier of Tongking (Map: China, C 7). It is a military station of some importance and has a considerable Chinese garrison. It was opened to French commerce in 1889, but so far its trade is insignificant. The town is connected by telegraph lines with Canton, Meng-tsze, and Tongking. A railway line from Lang-son in Tongking to Lungchow is being constructed (1903) by the French. The population is estimated at over 20,000.

LUNGE, lụng′e, GEORGE (1839—). A German chemist. He was born at Breslau; studied there and at Heidelberg; and was engaged in Germany and England, especially at South Shields (1867), as chemist in the distillation of coal-tar and the manufacture of soda. In 1876 he was elected professor of chemistry in the Zurich Polytechnic. He wrote: *Industrie des Steinkohlenteers und Ammoniaks* (1867; 4th ed. 1900); *Handbuch der Sodaindustrie* (1879-80; 2d ed. 1893-95); *Taschenbuch für Sodafabrikation* (1883; 3d ed. 1900); *Sulphuric Acid and Alkali* (1879-80; 2d ed. 1891-96); *Coal-Tar and Ammonia* (1882; 3d ed. 1900); *Alkali Maker's Handbook* (with Hurter, 1884; 2d ed. 1891); and *Chemisch-technische Untersuchungs-Methoden* (1899-1900).

LUNG FEVER. A disease of domestic animals. See PLEUROPNEUMONIA.

LUNGFISH. A dipnoid fish, so named because of the presence of air-breathing organs in addition to gills. Their representatives were much more numerous in Paleozoic times (see COCCOSTEUS; DIPTERUS, and other names of fossil dipnoans) than at present, when the New Zealand Ceratodus, the African Protopterus, and the South American Lepidosiren alone represent the group. See DIPNOI (and its plate); MUDFISH; BARRAMUNDA.

LUNG-WORMS (AS. *lungen*, OHG. *lungunna*, Ger. *Lunge*, lung; connected with AS. *lēoht*, *lēht*, *līht*, Goth. *leihts*, OHG. *līhti*, *līht*, Ger. *leicht*, Lat. *levis*, Gk. *ἐλαχύς*, *elachys*, Lith. *lengwus*, Skt. *laghu*, *raghu*, light, not heavy). Slender, round worms of the species *Strongylus filaria*, *Strongylus rufescens*, and *Pseudalius ovis*, which sometimes infest the lungs and bronchi of sheep and cause a serious disease. When the worms are found in the bronchi the disease is sometimes known as verminous bronchitis or hoose. The chief symptoms of the disease are fits of coughing and sneezing, accompanied by discharges from the nostrils. Infected animals move about with the neck outstretched, rub the nose on the ground, and breathe with difficulty. A pronounced diarrhœa may also appear and hasten the usual emaciation. The wool becomes loose and may be shed. The skin appears white and bloodless, which gives the disease the popular names 'white-skin' and 'paper-skin.' The lungworms infest sheep, cattle, and hogs, and the disease is most prevalent in years with a wet summer preceded by a moderate winter. Water is the usual source of infestation. Affected animals should be separated from healthy ones, and all animals should be placed on dry pastures with pure water-supply. Infected calves or sheep may be confined in a close shed, and made to inhale chlorine gas or sulphur fumes. Good results have also been obtained in the treatment of calves by injecting between the rings of the trachea a mixture of equal parts of turpentine and sweet oil, to which a few drops of carbolic acid have been added. Consult: *Ohio Experiment Station Bulletin 91; Arkansas Experiment Station Bulletin 35.*

LUNGWORT, or OAK-LUNGS (*lung* + *wort*, AS. *wyrt*, Goth. *waurts*, OHG. *wurz*, Ger. *Wurz*, root plant; connected with Lat. *radix*, Gk. *ῥάδαμνος*, *rhadamnos*, bough), *Sticta pulmonaria.* A lichen with an olive-green, foliaceous, leathery spreading thallus (pale brown when dry), found on trunks of trees in mountainous regions in North America and European countries, sometimes almost entirely covering them. It has been used as a remedy for pulmonary diseases, but when properly prepared is more commonly used as a light diet similar to Iceland moss, for which it is sometimes substituted; yet it is bitter enough to be used instead of hops. It yields a good brown dye. Its name is derived from the fancied resemblance of its corrugated spotted thallus to the lung. The name lungwort is also given to a genus of phanerogamous plants (Pulmonaria), of the natural order Boraginaceæ. The lungwort (*Pulmonaria officinalis*) common in some parts of Europe has ovate leaves and purple flowers, and was formerly employed in lung diseases, but is now used in the north of Europe only as a pot-herb.

LUNT, GEORGE (1803-85). An American poet and journalist, born in Newburyport, Mass. Lunt was graduated at Harvard in 1824, taught in the Newburyport High School, and was soon after admitted to the Essex bar (1827). He served in the State Legislature and in the Whig National Convention of 1848. President Taylor made him United States District Attorney. Later he resumed the practice of law and edited for a time the Boston *Courier*. In later years he was a Democrat. He died in Boston. He wrote several volumes of poems and essays.

LU′PERCA′LIA (Lat. nom. pl., from *Lupercus*, name of a deity, he who wards off wolves, from *lupus*, wolf + *arcere*, to ward off). A festival among the ancient Romans, held on February 15, in honor of Faunus, an old Italian god of the herds and fertility. The Lupercal was a cave on the Palatine sacred to the god, and it is significant that the priesthood formed two bands, one said to be restricted to the Quinctii of the Palatine, the other to the Fabii of the Quirinal. The god Lupercus seems to be purely an imaginary creation from a misinterpretation of the name of the festival. While the whole body of *pontifices* seem to have taken part in the festival, the chief rôle naturally fell to the Luperci. They sacrificed a goat and a dog, after which two young men were touched on the forehead with the bloody knife; the mark was then washed away with wool dipped in milk, upon which the youths were obliged to laugh aloud. The Luperci then, naked but for a goatskin about the loins, and holding in their hands strips of the skin of the slaughtered goat, ran around the foot of the Palatine, starting from the Lupercal, striking the women they met across the palm of the hand with the leathern thongs, a proceeding which was believed to produce fertility and a safe delivery. The whole ceremony is obviously a ceremony of purification and atonement to produce the increase of the community and of its herds.

LUPINE (Lat. *lupinus*, *lupinum*, lupine, from *lupinus*, wolfish, from *lupus*, Gk. λύκος, *lykos*, Goth. *wulfs*, AS. *wulf*, Eng., OHG. *wolf*, Ger. *Wolf*, OChurch Slav. *vlŭkŭ*, Lith. *vilkas*, Skt. *vṛka*, wolf; connected with Skt. *vraśc*, to rend, Gk. ἕλκειν, *helkein*, OChurch Slav. *vlĕkati*, to haul), *Lupinus*. A genus of annual and perennial herbs and half shrubs of the natural order Leguminosæ, natives of the Mediterranean region of temperate North and South America, about 90 species being indigenous to the United States, principally to the Rocky Mountains and Pacific Coast regions. Lupines were known to the ancient Greeks and Romans, who cultivated them for their seeds and for green manuring, for which and for ornamental purposes they are in general cultivation in temperate regions. They succeed best on light sandy loam soils, but fail on wet and calcareous soils or on sandy lands with a calcareous subsoil. They require no careful preparation of the soil. The most important species are the white lupine (*Lupinus albus*), the yellow lupine (*Lupinus luteus*), and the blue lupine (*Lupinus angustifolius*). The Texan species (*Lupinus subcarnosus*) also merits cultivation. All species are rich in nitrogenous matter, and when plowed under they enrich the soil in the same manner as clover and other leguminous plants.

LUPINE (*Lupinus subcarnosus*).

On an average the fresh lupine forage has the following percentage composition: Water, 85.4; protein, 2.8; fat, 0.3; nitrogen-free extract, 6.2; crude fibre, 4.6; ash, 0.7. The average percentage composition of lupine hay follows: Water, 9.3; protein, 11.9; fat, 3.3; nitrogen-free extract, 40.3; crude fibre, 27.5; ash, 7.7. Lupine-seeds are rich in protein, the yellow considerably more than the blue variety. Yellow lupine seeds have the following percentage composition: Water, 14.0; protein, 38.2; fat, 4.4; nitrogen-free extract, 25.5; crude fibre, 14.1; and ash, 3.8. The seeds contain a bitter principle, said to be harmful to stock. They may be disembittered by repeated extraction with cold water. They are very digestible. Sheep will learn to eat the seed before the bitter principle is removed. The use of lupine is not common in the United States, but is widespread in many regions of Europe.

LUP'TON, THOMAS GOFF (1791-1873). An English mezzo-tint engraver, born at Clerkenwell. He was a pupil of George Clint, afterwards assistant to S. W. Reynolds, and he was one of the first to employ steel in his art. The Society of Arts awarded him a medal in 1822. His best work was done in seas and landscapes, and Ruskin gave high praise to his reproductions of Turner's *Rivers and Harbours of England*, which appeared about 1826. For Turner he made four of the *Liber Studiorum* plates, displaying so fine and delicate a touch that they were esteemed as among "the most famous works of engraving that exist."

LUPUS (Lat., wolf). A term denoting a form of tuberculosis of the skin appearing at first in small nodules. These nodules are of dark, reddish color, and are soft. They increase in size in time and sometimes form appreciable elevations while starting beneath the surface. They may become absorbed or may break down and ulcerate. If the nodules remain small and undergo no further evolution, the variety is termed *lupus maculosus;* when inflated and of considerable size, *lupus tumidus;* when shrunken and replaced by cicatrices, *lupus exfoliativus;* when the nodules are scattered about in disorder, *lupus disseminatus;* when they break down and ulcerate, *lupus exulcerans* or 'rodent ulcer.' The ulcers are not painful, but they follow the lymph-channels and spread, tissue of all kinds, including muscle, cartilage, and bone, being involved in the destruction. Lupus of the face sometimes results in the loss of the nose (a favorite starting-point of the disease), the lips, the ears, and the cheeks. Frightful disfigurement results, and after the disease has been checked extensive plastic operations are necessary to restore the patient to an endurable condition. Next to the face, the extremities are the most common seat of lupus, especially the forearms and legs. The mucous membranes may be attacked extensively.

There are no drugs that cause the absorption of the neoplasm. Some favorable results have followed the use of Koch's tuberculin R, but it is still under experiment. Injections of thiosinamin were partially successful in the hands of Hebra. Finsen's phototherapy (q.v.) has proved successful in several cases, and the X-ray (q.v.) has also been successful. Curetting, scarification, excision, and caustics have each benefited some cases. The usual prophylaxis against tubercule infection must be rigidly observed. See TUBERCULOSIS. Consult: Hyde, *Diseases of the Skin* (Philadelphia, 6th ed., 1901); and Finsen, *Phototherapy*, trans. by Sequeira (London, 1901).

LUR (Swed., Norw., Dan., trumpet, from Icel. *ludr*, hollowed piece of wood). An instrument made from birch-bark, and used by the shepherds of Scandinavia as the alpenhorn is used in Switzerland. Recently some bronze lurs of great antiquity have been unearthed in Sweden and Denmark. These specimens vary in length from 5 to 7½ feet, and the long, slender tube bends around in a double curve.

LURAY, lû-rā′. A town and the county-seat of Page County, Va., 100 miles west by south of Washington, D. C.; on the Norfolk and Western Railroad (Map: Virginia, F 3). It has the Luray College for Young Ladies; and there are some manufacturing plants, including a large tannery, a wood-working establishment, flour-mills, carriage and wagon shops, and a distillery. The water-power afforded by a creek that flows through the town is utilized in some of the industrial plants. Luray is picturesquely situated in the Page Valley, with fine views of the adjacent mountains, and is a popular resort, widely known because of the Luray Cave (q.v.). Mineral springs abound in the vicinity. Population, in 1890, 1386; in 1900, 1147.

LURAY CAVE. A cave in Page County, Va., in the limestone formation of the Shenandoah Valley, a short distance west of the village of Luray, on the Norfolk and Western Railroad. The cavern was discovered in August, 1878, by Andrew J. Campbell and others. It underlies an area of about one hundred acres, and consists of innumerable chambers, only a few of which have been explored. There are several tiers of galleries, the vertical depth of which, from the highest to the lowest, is about 260 feet. Although small in comparison with the Mammoth Cave of Kentucky, it is remarkable for the great number and beauty of the stalactites. The cave is lighted with electric lights, and attracts thousands of visitors annually.

LURCHER (from *lurch*, assibilated form of *lurk*, from Swed. *lurka, lirka*, to lie hid, from *lura*, to lurk, Icel. *lūra*, to slumber, Ger. *lauern*, to lurk). A kind of dog, somewhat resembling a greyhound, and derived from a greyhound crossed with the shepherd's dog. It is lower, stouter, and less elegant than the greyhound, almost rivals it in fleetness and eyesight, and much excels it in scent. It is covered with rough, wiry hair, is usually of a sandy red color, although sometimes black or gray, and has half-erect ears and a pendent tail. It is the poacher's favorite dog, as it possesses all the qualities requisite for his purposes; in sagacity it rivals the most admired dogs, and it learns to act on the least hint or sign from its master. When this dog is crossed with any other breed the product is technically a 'cur.' English literature, from Milton onward, abounds in references to the lurcher.

LURGAN, lûr′gan. A town in County Armagh, Ireland, 20 miles southwest of Belfast (Map: Ireland, E 2). It has flourishing linen manufactures of cambrics, damasks, lawns, etc., and an important weekly market of agricultural produce. The United States is represented by a consular agent. Population, in 1881, 10,135; in 1901, 11,777.

LURIS, lōō′rēz. The people after whom Luristan, a mountainous region in Western Persia, bordering on Turkey, has been named. They belong to the same Iranian stock as the rest of the Persians, but are looked upon by some authorities as presenting a very pure racial type. The Luris have a better reputation than the Kurds, and are more independent, courageous, and honest than many of the other sections of the Persian population. They are divided into the 'Great Luris' (or Bakhtyari) in the east, and the 'Little Luris' (or Feili) in the west. Consult: De Morgan, *Mission scientifique en Perse* (Paris, 1894-97); Dieulafoy, *La Perse, la Chaldée et la Susiane* (Paris, 1887); Layard, *Early Adventures in Persia, Susiana, and Babylonia* (London, 1887); Houssaye, *Les races humaines de la Perse* (Lyon, 1888).

LURISTAN, lōō′rĭs-tän′. A region of Persia. See LURIS.

LURLEI, lōōr′lī. A cliff on the Rhine. See LORELEI.

LÜRSSEN, lṳr′sen, CHRISTIAN (1843—). A German botanist, born in Bremen. He studied at Jena and Leipzig; was made curator of the herbarium in the latter university (1881), professor in the School of Forestry at Eberswalde (1884), and at Königsberg (1888). He specialized in the study of higher forms of cryptogams, and wrote: *Filices Græffeanæ, zur Kenntniss der Farnflora der Viti, Samoa, Tonga und Ellice Inseln* (1871); *Beiträge zur Entwicklungsgeschichte der Farnsporangien* (1872); a valuable *Medizinisch-pharmazeutische Botanik* (1877-82); and *Grundzüge der Botanik* (1877, 5th ed. 1893).

LUSA′TIA, Ger. **LAUSITZ**, lou′zĭts. A district in Germany between the Elbe and the Oder, consisting of Upper and Lower Lusatia (Map: Germany, F 3). The former is now divided between the Kingdom of Saxony and the Prussian Province of Silesia, while the latter forms a part of the Prussian Province of Brandenburg. Lusatia has its name from a Slavic tribe who were settled here, and who were conquered by the Germans in the tenth century. After belonging for a time to Brandenburg, the whole of Lusatia became in the fourteenth century a possession of the Crown of Bohemia. By the Peace of Prague, in 1635, the territory passed to Saxony, which had to cede a large part of it to Prussia in 1815.

LUSHAIS, lōō-shīz′. The natives of the Lushai Hills in the Cachar District of Assam, part of the Chittagong hill region in Bengal, and the adjacent Burmese territory. By language they are related to the Thai (Siamese, Burmese, etc.) stock. The Lushais proper are described as rather slenderly built and brown-skinned, with prominent cheek bones and flat nose. They had the reputation of being very warlike, and had conquered the smaller tribes of their habitat. Previous to their pacification in 1888 by the British they were looked upon as head-hunting savages, but in 1900 it became evident that this view was entirely erroneous. The language of the Lushais was reduced to writing in a modified Roman alphabet by the missionaries in 1894-97. In 1898 a grammar and dictionary were published, and since then some readers, containing extracts from the Bible, folk-lore items, and the like. The Lushais south of Manipur are considered by some scholars to be Nagas mixed with Kyens and Burmese of Arakan. Consult: Dalton, *Descriptive Ethnology of Bengal* (Calcutta, 1872); Soppit, *Short Account of the Kuki-Lushai Tribes on the Northeast Frontier* (Shilling, 1887); Reid, *Chin-Lushai Land* (Calcutta, 1893).

LUSHINGTON, lŭsh′ĭng-tŏn, STEPHEN (1782-1873). An English jurist. He was born in London, was educated at Oxford, and was called to the bar in 1806. From 1806 to 1841 he was a member of Parliament. He was a follower of Fox and Grenville, in 1817 was counsel for Lady Byron, and in 1820, in conjunction with Lords Denham and Brougham, was of counsel for Queen Caroline. In 1828 he was appointed a judge of the Consistory Court, in 1838 judge of the Admiralty Court, and in the latter year was sworn in the Privy Council. He was regarded as an authority on ecclesiastical law.

LŬ-SHUN-K'OW. A naval station in China. See PORT ARTHUR.

LUSIAD, THE. An historical epic, dealing with events in the history of Portugal. See CAMÕES.

LUSIGNAN, lu'zē'nyäɴ'. A noble French family of the age of the Crusades, the most celebrated member of which was Guy of Lusignan (q.v.).

LU'SITA'NIA. A district of ancient Hispania (q.v.), which, as the country occupied by the Lusitani, was, according to Strabo, bounded south by the Tagus, and north and west by the ocean. Its extent afterwards was contracted by the growing importance of the Callæci, and the river Durius (*Douro*) became its northern boundary. Afterwards, many of the Lusitanians being driven southward in their long struggles with the Romans, the name Lusitania was given to the district south of the Tagus. When Augustus divided Hispania into three provinces, Bætica, Tarraconensis, and Lusitania, the last occupied the southwest, between the Anas (*Guadiana*) on the east, the sea on the south and west, and the Durius on the north. It comprised the greater part of the modern Kingdom of Portugal, besides a large portion of León and the Spanish Estremadura. Some of the principal towns were Metellinum (*Medellin*); Emerita Augusta (*Mérida*), the Roman capital, on the Anas; Olisipo (*Lisbon*), the capital before the time of the Romans; Conimbriga (*Coimbra*), on the Munda; Salmantica (*Salamanca*); Pax Julia (*Beja*); Ebora (*Evora*). The province was anciently rich and fertile, and had valuable mines of gold and silver. The Lusitani were a wild and warlike people, much addicted to plunder, especially those living in the mountains, and were accounted the bravest of all the Iberians. The Romans successfully invaded their territory in the early part of the second century B.C. In B.C. 153 they revolted, and for fourteen years fought against the Romans, who for a time acknowledged their independence. Viriathus, their chief, a bold and skillful leader, defeated several Roman generals. At length the Consul Cæpio, unable to subdue him in the field, captured him by the treachery of some of his intimate friends, and put him to death (about B.C. 140), soon after which the Lusitanians were completely subdued.

LUSK, WILLIAM THOMPSON (1838-97). An American obstetrician, born at Norwich, Conn. He was a student at Yale College (1859-60), then studied medicine at Heidelberg and Berlin (1860-61), served in the Union Army during the Civil War (1861-63), and graduated at the Bellevue Hospital Medical College in 1864. He then pursued his studies in Edinburgh, Paris, Vienna, and Prague. Returning to New York in 1865, he began practice and rose rapidly in his profession. He was made professor of physiology at the Long Island College Hospital in 1868; lecturer on physiology at the Harvard Medical School in 1870; and was professor of obstetrics and diseases of women in Bellevue Hospital Medical College from 1871 till his death. He was co-editor of the *New York Medical Journal* from 1871 to 1873. His book on *The Science and Art of Midwifery* (New York, 1882) has passed through several editions and has been translated into several foreign languages.

LUSSAN, lụ'säɴ', ZÉLIE DE (1863—). An American dramatic soprano, born in New York of French parents. Her mother was a brilliant vocalist, and the daughter early began the study of music, making her first public appearance when nine years old. She sang at Wagner festivals, then joined the Boston Ideal Opera Company and made her operatic début in 1886 as Arline in Balfe's *Bohemian Girl.* In 1889 she went to London, where she was enthusiastically received, and joined the Carl Rosa opera troupe. In 1894 she appeared at the Metropolitan Opera House, New York; in 1895 and 1896 she sang in Spain, Portugal, and France; in 1897 and 1899 she again visited the United States, and in 1902 made a concert tour of that country. Her most successful rôles include: Carmen (rendered over 600 times); Mignon; Musette, in *La Bohême;* Zerlina, in *Don Giovanni;* Marie, in *La fille du régiment;* and Marguerite, in Berlioz's *Damnation de Faust.*

LUSSIN, lụs-sēn', or **LOSSINI,** lŏs-sē'nē. A small island in the Adriatic, situated near the entrance to the Gulf of Quarnero and belonging to the Austrian Crownland of Istria (Map: Austria, D 4). Area, about 29 square miles. Population, in 1900, 11,615, consisting chiefly of Italians and Croats. The inhabitants are engaged in agriculture, seafaring, ship-building, and fishing. The chief town, Lussin Piccolo, has a good harbor, a nautical school, and a population of 7027 in 1900.

LUSTRATION (Lat. *lustratio*, from *lustrare*, to purify, from *lustrum*, purificatory sacrifice, from *luere*, Gk. λούειν, *louein*, to wash). An ancient ceremony, the object of which was to retain or reëstablish those friendly relations with the gods upon which the prosperity of the community depends. This may be accomplished by purification by various means, which will remove any defilement, or by leading the sacrificial victim around the object to be purified, and thus symbolically shutting out impurity. The purification was accomplished by fire, water, sulphur, or other fumes. These ideas appear prominently at many of the Roman festivals, such as the Palilia or Parilia, when the herds and people were purified, or the Amburbium or Ambarvalia, when the victims were led around the city or the fields, and still more at the purification of the assembled people on the Campus Martius at the close of the census taken every five years. At this *lustrum*, the *suovetaurilia*, or the boar, sheep, and ox offered to Mars, were led solemnly around the gathering and then sacrificed, with a vow of a similar offering if prosperity were granted the community for the ensuing five years. It may be noted that the term *lustrum* came to denote the whole period between these lustrations. Not only were these state purifications usual at regular seasons, but any prodigy indicating the displeasure of the gods called for lustrations, often on a very elaborate scale. Moreover, many of the acts of daily life, especially those connected with marriage, birth, and death, called for purificatory rites, not only among the more formal Romans, but also among the Greeks.

LUSTRE MOTTLING. See DIABASE.

LUSTRUM. See LUSTRATION.

LUTANGA, lōō-tän′gȧ. A Mohammedan mixed race of Moros and Subano Malays, who inhabit the island of Olutanga and the adjacent coast of the Province of Zamboanga, island of Mindanao, Philippine Islands. See PHILIPPINE ISLANDS.

LUTAYO, lōō-tä′yō. A Filipino tribe. See PHILIPPINE ISLANDS.

LUTE (OF. *lut, leut*, Fr. *luth*, from Sp. *laúd*, Port. *alaude*, lute, from Ar. *al'ūd*, the lute, from *al*, the, and *'ūd*, lute, wood). An obsolete stringed musical instrument, which has been superseded by the harp and guitar. It consisted of a table of fir; a body or belly, shaped like the back of a mandolin; a neck, or finger-board, of hard wood, on which were 9 (or 10) frets, stops, or divisions, marked with catgut strings; a head, or cross on which were placed the pegs or screws that tightened or relaxed the strings in tuning; and a bridge, to which the strings were attached at one end, the other end being fastened to a piece of ivory, between the head and neck. The strings varied in number, from 6 to 13, all of them, except the highest or melody string, being doubled. The performer used his left hand to press the stops, and struck the strings with his right. A peculiar description of notation, called *tablature*, was employed in music written for the lute. The lute is one of the oldest of musical instruments, as representations of it are found on ancient Egyptian monuments. Very likely the Persians adopted the lute from the Egyptians about the fourth century B.C. From the Persians it passed to the Arabs, with whom it soon became the chief instrument. During the supremacy of the Saracens the lute was introduced into Spain and Lower Italy, whence it found its way into all European countries during the fourteenth century. From that time on until the end of the seventeenth century the lute was the principal instrument, occupying a position very similar to that of the modern piano. It was also one of the chief instruments in the orchestra. Beginning with the eighteenth century the lute was gradually superseded by the violin in the orchestra, and by the clavichord as a general instrument. In the early operas the lute was used to accompany the recitatives. Valuable information about the lute is found in Wasielewski's *Geschichte der Instrumentalmusik im 16ten Jahrhundert* (Berlin, 1878). See TABLATURE, and for illustration see MUSICAL INSTRUMENTS.

LUTE (OF., Fr. *lut*, clay, lute, from Lat. *lutum*, mud, from *luere*, Gk. *λούειν*, *louein*, to wash). A pasty cement that is used for sealing the joints of apparatus so as to prevent the escape of vapors or gases, or for coating glass vessels in order to render them capable of sustaining a high temperature. The lutes commonly used consist of common plastic clay or pipeclay, made into a pasty mass by the addition of linseed meal or almond powder. Such material will stand a temperature of 260° C. (500° F.); while for more delicate work, fat lutes, consisting of powdered dry clay mixed with a drying oil or glycerin to a thick paste, are used. Consult: Spon, *Workshop Receipts* (London, 1883); *Scientific American Cyclopædia of Receipts, Notes and Queries* (New York, 1892). See CEMENTS.

LUTERO, lōō-tä′rō, BATTISTA DI VICCOLO. An Italian painter. See DOSSO DOSSI.

LUTH. A sea-turtle. See LEATHERBACK.

LUTHARDT, lōōt′härt, CHRISTOPH ERNST (1823-1902). A German Lutheran theologian, born at Maroldsweisach and educated at Erlangen and Berlin. After lecturing two years at Marburg he went in 1856 to Leipzig as professor of systematic theology and New Testament exegesis. His theological works were varied and many; their tone was that of the Erlangen School; and their author was a prominent churchman and leader of the modern orthodox party. He edited the *Allgemeine evangelisch-lutherische Kirchenzeitung* (1868-80), the *Theologisches Litteraturblatt* (1880 seq.), and the *Zeitschrift für christliche Wissenschaft und christliches Leben* (1880-89), and wrote: *Das Johanneische Evangelium* (1852; 2d ed. 1875-76); *Kompendium der Dogmatik* (1865; 9th ed. 1893); *Apologie des Christentums* (1864 and after); *Geschichte der christlichen Ethik* (1888); and contributions to Strack and Zöckler's *Kommentare* on the Gospel of John (1886), the Epistle to the Romans (1887), and the Johannine Epistles (1888).

LU′THER, MARTIN (1483-1546). "The founder of Protestant civilization," as Pfleiderer calls him, was of lowly origin. The child of peasant parents, he was born on November 10, 1483, in the heart of Germany, at Eisleben, Saxony. His father, Hans Luther, a miner, and his mother, Margaret, were austerely virtuous and pious. They were able to put their son under good tuition for a year at Magdeburg, and then at Eisenach for four years. Here, to eke out his scanty means, Luther with other schoolmates occasionally sang for alms in the streets.

At the age of eighteen Luther entered the university at Erfurt, where his ability secured for him the admiration of his fellows. The new learning of the Renaissance was already astir in Germany, and Luther, attracted to it, read Ovid, Vergil, and Cicero, but devoted himself mainly to philosophy. More, however, than by Trutvetter, his teacher in philosophy, was Luther impressed by the preaching of the Erfurt pastor, Weissmann.

His father had made great sacrifices to equip his son for the career of a lawyer, and Luther now stood at its threshold, having taken his degree of M.A. in 1505, at the age of twenty-two. But although he was outwardly upright and pure, his conscience, sensitized by early influences and education, trembled with conviction of shortcomings to divine requirements and of exposure to divine wrath. According to the mediæval teaching, the surest way to perfection was found in the cloister. This great renunciation, all unconscious of the career it was to open, Luther now made, to the astonishment of his friends and the profound displeasure of his father. Various thrilling experiences, such as a dangerous illness and the death of a near friend, concurred to confirm his resolution, and immediately after taking his degree he entered the Augustinian convent at Erfurt, taking, however, his Plautus and his Vergil with him.

Luther had fled from the world, but not from himself. His mental struggle grew more intense; his self-imposed austerities surpassed those of his brethren, and left their mark on his constitution. Light broke upon him in the opening of his trouble to the kindly vicar-general of his Order, Staupitz, who had imbibed the thought of the mystics and of Saint John, that the love of God and of righteousness is the great thing, and that repentance begins in this.

At the end of two years Luther was ordained to the priesthood, and on Staupitz's recommendation was made professor at Wittenberg, where the Elector Frederick the Wise of Saxony had founded a university in 1502. He had perseveringly studied Saint Augustine, and knew by heart the English schoolman William of Occam, whose writings were, in an ecclesiastical sense, of revolutionary tendency. Another molding influence of this period was his visit to Rome on business of his Order in 1511 during the pontificate of the warlike Julius II. He had begun his professorship by lecturing on Aristotle, but soon turned to the Bible, his lectures on which drew his fellow-professors with throngs of students. Staupitz thereupon constrained him to preach, and crowds were attracted by his unconventional presentation of biblical truths. One of these sermons so impressed the Elector Frederick that he offered to bear the expense involved in Luther's promotion to the doctorate of theology in 1512. At this time he began work on what remained through life his favorite books on his central theme of justification through faith—the Epistles to the Romans and the Galatians, the latter of which he used to call humorously his wife. His first publication was an edition of the mystical treatise *Theologia Germanica*, which he discovered in 1516, to which he said he owed for its exposition of the Christian life more than to any other book except the Bible and Saint Augustine. His first work as an author was an *Exposition of the Seven Penitential Psalms* in the memorable year 1517. Meanwhile he laboriously fulfilled the duties of his Order, of which Staupitz had made him district vicar, and when the plague fell upon Wittenberg he held to his post while others fled.

Now came the historic turning-point, when Luther's deep but yet unconscious break with the Roman Catholic Church revealed itself. In 1517 Johann Tetzel, a Dominican monk, appeared preaching indulgences. Indignant at his abuse of the Church doctrine regulating these, and unable to induce princes and bishops to exclude him, Luther struck the first blow that led to such startling and far-reaching results. Yet the ninety-five theses which he nailed to the door of the Wittenberg church, October 31, seem singularly moderate; they oppose not indulgences, but 'the senseless gabble' of such traffickers as Tetzel; they emphasize the indispensableness of contrition, and the superiority to indulgence-buying of charity to the poor. In a fortnight these theses, translated from their Latin into German, had spread throughout the country. Yet Luther contemplated no break with the Church, and still acknowledged the supremacy of the Pope.

He now devoted himself to Church history and the study of canon law, for the support of the positions he had taken in the course of the controversy which he had provoked. Meanwhile, he continued the preparation of popular religious publications, such as an *Exposition of the Ten Commandments* and of the *Lord's Prayer*, a piece of his best work. In 1518, at a general meeting of his Order at Heidelberg, he held a public disputation, in which he attacked the scholastic methods in theology. Among the disciples there gained was the afterwards distinguished Bucer. The same year also he was joined by his ablest helper, Melanchthon, who took the professorship of Greek at Wittenberg. That he was feeling his way to advanced positions appeared in the extensive elaboration of his theses that same year, entitled *Resolutions*. In this he contested the claim of the Roman Pontiff to be the custodian and dispenser of the merits of Christ through indulgences, affirming that penances and satisfactions had been instituted, not by Christ, but by the Pope and the Church. These *Resolutions* he dedicated to the Pope with a letter the inconsistencies of which indicated that he had not yet reached firm ground except on one point —his unchangeable conviction as to indulgences.

Leo X., at first contemptuous, soon became angry. He had cited Luther to appear at Rome within sixty days, but before the time expired issued orders for his seizure. The Elector Frederick procured a change of his place of hearing from Rome to Augsburg before the Papal Legate, Cardinal Cajetan, with a guarantee of safety. Luther and he merely measured swords and parted, the Legate insisting on an unconditional retraction, which Luther refused. Luther immediately published an account of the interview and advanced to a radical position. The Papacy he held to be divinely established only in the sense in which all government is ordained by God; it was not of the essence of the Church.

More sure of himself than ever, Luther's timidity began to give place to the stern joy of one fighting, as he believes, in a just cause. He affirmed that the opposition was inherently rotten; he intimated to the Elector's Court preacher, Spalatin, his doubt whether the Pope were the Antichrist or his apostle. The Elector counseled moderation, and another effort was made for peace. This time the Papal Legate, Miltitz, took a different tone, largely humoring Luther, but urging him to have regard to the authority of the Church, weakened by his disrespectful attitude to the Pope. It was agreed that Luther should write apologetically to Rome, that both parties should cease the controversy, and that the Pope should submit it to a body of learned divines.

But the kiss of peace which Miltitz and Luther exchanged at parting was illusive. The conflict was irrepressible. Eck, a Dominican monk, from the first a leader in the attack on Luther, broke the truce by leveling thirteen theses at him, and challenging Carlstadt, Luther's colleague, to dispute them. Carlstadt being overmatched, Luther had to take the field. Nine summer days in 1519 he and Eck crossed swords at Leipzig in the presence of a distinguished audience. The disputants quickly plunged below the superficial to the central issues. Could there be a true Church without a pope? Eck denied it; Luther affirmed it, interpolating in his Latin speech a German sentence to the effect that the cardinal point of controversy was whether the Papacy was divinely instituted in any other way than

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FROM A PORTRAIT BY LUCAS CRANACH IN THE ROYAL GALLERY, DRESDEN

the Imperial Government was. On this point he held that the Council of Constance (1415) had erred, whereupon Eck refused to debate further with a 'Hussite,' and so they parted. In Luther's published account he struck the keynote of Protestantism, saying that the true Church is the communion of true believers, real though invisible, and that every lay member who holds to Holy Scripture is more to be believed than popes and councils who do not hold to it. His doctrines had already spread far and wide. In the year following more than a hundred editions of his books were printed and reprinted.

The Leipzig disputation opened all eyes to the gravity of the crisis. At Rome it was felt that Luther must now be crushed. Luther also saw the hopelessness of his case, and the necessity of an appeal from pope to princes. And so in June, 1520, he published his classic address, *To the Christian Nobility of the German Nation*, in which he outlined his thought of a general reform of national culture and life. In this address Luther declared against the superiority claimed by ecclesiastical over civil government. Alarming rumors came from Rome, where the Papal anathema had been already issued; friends counseled silence. "The die is cast," he replied; "the time to speak has come;" and forthwith issued a treatise on *The Babylonian Captivity of the Church*, published in October. The country was flooded with prints and caricatures on both sides; there was extreme excitement; Luther thought the end of the world drew near. Yet he wrought as closely as ever at his ordinary work in the pulpit and in the university, where the number of students had trebled since the publication of his theses. In the same year of stress and strain he published his treatise on *The Freedom of a Christian Man*, setting forth his view of the social as well as spiritual character of vital religion, and laying "the foundation of a new ethics."

The bull delivering Luther to death was published by Eck at Leipzig, in October, 1520. Luther answered by a deed that fixed the eyes of Europe upon him. On December 10th he uttered his personal defiance by committing the bull to the flames. Into the same fire also were cast a number of Roman law-books, his defiance of tyranny. A week later he put forth in legal form his appeal to a general Church council. Luther was fortunate in the friendship of the Elector, Frederick the Wise. On the death of the Emperor Maximilian in 1519, this Prince declined the crown, and procured the election of Charles of Spain (Charles V.) to the Imperial throne. His influence in behalf of temporizing measures when the Pope demanded summary procedure was seconded by other princes, who had a list of a hundred grievances against Rome. It would be iniquitous, they said, to condemn Luther unheard. A hearing before the dignitaries of the Empire was what Luther most desired. And so, under the Imperial safe-conduct, he appeared at the Diet of Worms in 1521. Surprised at his first hearing by a more peremptory demand for recantation than he had expected, he asked for a day to consider it. The day following, April 18th, he made answer that his writings were of three kinds—such as even his opponents would agree to; such as condemned the errors of the Church and could not be retracted, except on proof from Holy Scripture that he had erred; some others in which he had attacked certain persons perhaps too violently. Pressed again by the question whether he would recant, he refused in memorable words: "Here I stand; I cannot do otherwise; God help me; Amen." Further negotiations the next day failed to move him, and he was permitted to depart. A month later, after the expiration of his safe-conduct, the ban of the Empire was pronounced against him.

His friend the Elector now judiciously intervened. Having prearranged with Luther that he should suffer himself to be kidnapped on the road home, Frederick secreted him in the Wartburg castle at Eisenach so effectively that for months his friends knew not where he was. Residing here under an assumed name for the rest of the year, he turned his confinement to good account. He began his great translation of the Bible, finishing the New Testament from Erasmus's Greek text in four months. Here also he began his first series of sermons, designed for the new preachers of the Gospel as well as for the laity. But his confinement told upon his health, and out of low spirits the spell of the current demonology bred visions of demons besetting him. Much more serious trouble came from his dear Wittenberg. Not content with Luther's opposition to monachism, a celibate priesthood, relic-worship, and the mass, such men as Carlstadt had rushed into an iconoclastic puritanism. Fanatical prophets came forward proclaiming that all priests were to be slain, all sinners destroyed, and the saints to assume the Kingdom. A flying visit in secret having failed to check the disorder, Luther reappeared openly at Wittenberg in January (or, according to some authorities, March), 1522, at his personal risk, as he was legally an outlaw, replying to the Elector's dissuasion that God would protect him. Eight days in succession he was in his pulpit; his voice quelled the popular disorders. He not only resumed his full round of work in church and university, but boldly made a preaching tour through neighboring towns, and at Zwickau, the seat of the prophets, is said to have had an audience of twenty-five thousand. Meanwhile, with Melanchthon's help, he brought out a revised edition of his New Testament, and continued his work on the Old. Another important work at this time was necessitated by the antagonism to civil authority in which he and his followers had been placed by the Edict of Worms. And so he wrote *Of Secular Government: How Far It Must Be Obeyed*, a statement of the general Protestant doctrine since current. While adhering to his cautious policy of slow change in the forms of worship, his introduction of choral hymns was a forward step of far-reaching effect. Luther's hymns, said a Jesuit, slew more souls than all his books and sermons. A tiny collection of eight hymns, half of them by Luther, appeared early in 1524. Twenty others he added that year. His famous lyric, "A mighty fortress is our God," well called the battle-hymn of the Reformation, appeared in 1529. In 1524 he addressed a letter to the councilors of all cities on the school system, and engaged personally in establishing a school at his native Eisleben.

As in Wiclif's England, so in Germany a social ferment accompanied the religious revolution, and had risen to a pitch beyond his control. The futile and fatal insurrection of the peasants was a grievous blow to Luther as well as to his cause.

His much blamed exhortation to the princes to crush the bloody revolt was intended to clear his religious policy from alleged complicity with anarchy. This year also his breach with Erasmus culminated in bitter quarrel and invective, discreditable to both. In this stormy year (1525) he married Katharina von Bora, a lady of noble family, fifteen years younger than he, a former nun, who had for some years been an adherent of the reformed religion.

The history of Luther's career here merges in the fortunes of the Reformation. The year 1529 is memorable for the unsuccessful effort made by the Marburg conference between Luther and Zwingli to draw into closer union the German and the Swiss reformers. The Augsburg Confession, presented at the Diet of 1530, the earliest symbol of Lutheran Protestantism, though drafted by Melanchthon, was drawn up from articles prepared by Luther. The Schmalkald League, formed in 1531 by the Protestants for self-defense, was not to Luther's liking; he counseled faith in God, and reliance on spiritual forces only. In 1534 he completed his great work, the Bible translation. In 1537 he drew up the Schmalkald Articles for Protestant use at the then hoped for general council. Meanwhile his polemic writings against Rome and his efforts for harmony among German Protestants continued; but repeated illnesses, often painful, and depression at the untoward state of the Reformation, frequently darkened his mind. In 1544 he wrote that he was old, worn out, and of no further use. In 1545 he quitted Wittenberg, but was prevailed upon by the Elector John Frederick and the university to return. That year he concluded his last work, a commentary on Genesis, begun ten years before, ending with the words, "I am weak and can do no more. Pray God He may grant me a happy and peaceful death." A journey in January, 1546, to end a quarrel of the counts of Mansfeld, brought on a severe cold, despite which he preached and worked as usual, and accomplished his peace-making mission, but his illness grew, and he passed away at Eisleben, February 18th.

Roman Catholic and Protestant estimates of Luther are antipodal. To the latter a religious hero, to the former he is a rash and reprehensible schismatic, a rebel against divinely constituted authority. By not waiting and working for that reform to come within the Church, which they regard as having come through the Council of Trent (1545), they hold that he disastrously divided Christendom and retarded the religious progress of mankind. Among his fellow Protestants he remained nearest to the Roman Catholic conception of the Church and its Eucharist. As a theologian he was often inconsistent, being surpassed by Melanchthon, and still more by Calvin. If lax Wittenberg be compared with strict Geneva, he was singularly deficient as a moral disciplinarian. His political ideal of German unity and independence has been realized only in our own time. By his Bible work, an unparalleled achievement of almost single-handed effort, "he created for the German people," says Pfleiderer, "the unified language which for centuries has been the single bond of the politically rent and divided tribes."

BIBLIOGRAPHY. Luther's works in Latin and German are voluminous. In the most accessible edition, that of Erlangen, edited by J. G. Plochmann and J. K. Irmischer, the Latin works fill 38 volumes (1829-86), and the German 67 volumes (1826-57). In 1883, under the editorship of J. C. F. Knaake, and patronized by the German Emperor, began to appear at Weimar what aims to be the definitive edition of Luther's works. Critical and expensive, it will require many years for completion, as only some twenty volumes have appeared. For general usefulness J. G. Walch's edition, published at Halle in 24 parts (1740-50), and carefully reprinted at Saint Louis, Mo. (1880 seq.), by the Concordia Publishing House, including six volumes of miscellaneous documents from different sources and of great interest, and ultimately to include the correspondence, is to be commended to readers familiar with German, as Luther's German has been modernized and his Latin translated. Only an exceptionally enthusiastic Luther student would care to read the innumerable sermons and voluminous commentaries which fill the greater part of these editions. Those who wish to enter more closely into his spirit should read his *Table-talk* (*Tischreden*, vol. xxii. in the Saint Louis Walch edition; also in Bohn's Library, translated and edited by W. Hazlitt). All students will consult his correspondence (*Briefwechsel*, ed. by de Wette and Seidemann, Berlin, 1825-56, and, better, *Mit Erläuterungen*, by Dr. E. L. Enders, Calw and Stuttgart, 1884 sqq., vol. viii., to April, 1531). In English there is less of Luther in satisfactory form. The translation of his *Select Works* by Rev. Henry Cole (London, 1824-26) is practically inaccessible. Of greater interest and accessible is his *Commentary on Galatians* (New York, 1878); also his *Commentary on the Sermon on the Mount*, well done by C. N. Hay (Philadelphia, 1893). Of primary importance, admirably translated by C. A. Buchheim and edited by H. Wace, is *First Principles of the Reformation, or the Ninety-five Theses and the Three Primary Works* ["Address to the Nobility of the German Nation," "Concerning Christian Liberty," and "On the Babylonish Captivity of the Church"] (London, 1883).

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For his theology separately considered, consult: Harnack, *Martin Luther in seiner Bedeutung für die Geschichte der Wissenschaft und der Bildung* (Giessen, 1883; 3d ed. 1901); Köstlin, *Luthers Theologie* (Stuttgart, 2d ed., 1901; Eng. trans., Philadelphia, 1898); C. P. Krauth, *The Conservative Reformation* (Philadelphia, 1871). Of Roman Catholic writers on Luther, consult: Janssen, *History of the German People* (Saint Louis, 1900); Verres, *Luther* (London, 1884);

also the English translation of Audin from the French (Philadelphia, 1841); also Walther's *Luther im neuesten römischen Gericht* (Halle, 1883-85). Of special importance from the Roman Catholic standpoint is M. Evers, *M. Luther, Lebens- und Charakterbild* (Mainz, 1883-91).

LUTHERANISM, AND THE LUTHERAN CHURCHES. The system of theological doctrine and Church polity established in the sixteenth century by Martin Luther and his associates, and the churches representative of such doctrine and polity. Nearly all Protestants of Germany are Lutherans; the established churches of Denmark, Norway, and Sweden are Lutheran in their theology; the people of Finland and about one-quarter of the population of Switzerland are Lutherans; Lutheran congregations are also found in the other countries of Europe, and in all parts of the world where Lutherans have immigrated. The name was first given to Protestants in derision by their opponents, and was not accepted without protest from Luther. The Protestant movement was not meant to be the founding of a new Church or sect. Luther and his coadjutors asserted that they aimed solely to purify the Church by reforming abuses which were generally admitted to exist. They advanced with caution, Luther's conservatism restraining radical and violent measures. While Wittenberg was the heart and centre of the revolution, heralds of the new teaching sprang up everywhere, and in all walks of life. When the Diet of 1530 was called to prevent the Empire from being rent by religious dissension, and the Lutheran princes and cities were summoned to give an account of themselves, their foremost theologians formulated the doctrines to which they held as their apology. From the city where it was presented, this is known as the Augsburg Confession (q.v.). In its first article the Reformers affirmed that they planted themselves on the decrees of the First General Council; and then, article by article, they profess their faith, protesting at the close that "in this sum of doctrine among us there is nothing which is discrepant with the Scriptures, or with the Church Catholic, or even with the Roman Church as known from its writers." The same position was maintained as to ceremonies: "Our churches are wrongfully accused of having abolished the Mass. For the Mass is still retained among us, yea and almost all the ceremonies that are in use, saving that with the things sung in Latin we minister certain things sung in German." (Art. xxiv.) Popular government in the Church was too great an innovation to be feasible, and the supreme direction of ecclesiastical affairs was committed to the civil rulers. This alliance of Church and State has seriously hampered the free development of Lutheranism.

The Lutheran churches to-day stand unequivocally on the same confessional foundation as in 1530. Additional confessions are recognized in some countries: the Apology by which Melanchthon answered the Roman Catholic Confutation at Augsburg, 1530; the Schmalkald Articles, prepared by Luther in 1537 for submission to a promised Ecumenical Council; the two Catechisms of Luther (1529); and the Formula of Concord, which in 1577 adjusted various controversies within the Church. These confessions, with the Apostles', the Nicene, and the Athanasian creeds, constitute the Book of Concord (q.v.). But the Augustana (the Augsburg Confession) is the sole universal symbol of Lutheranism.

DISTINCTIVE FEATURES OF LUTHERANISM. The revolt of Lutheranism from the Roman obedience coincides with the rise of Protestantism, but Protestantism early divided into two branches, the Lutheran and the Reformed. The question, What differentiates Lutheranism from other Protestants? has received various answers. The Lutheran Church had been identified with the conservative Reformation, the Reformed with the radical—a distinction justified by the violent measures employed by the latter, their complete break with the past, etc. Another view places the Lutheran centre of gravity "in the sphere of anthropology," while "the peculiarity of the Reformed theology is the absolute idea of God." According to another view, "The Lutheran doctrine comes through the Gospel to God, the Reformed through God to the Gospel." Kurtz characterizes Lutheranism as "the happy mean" between the antagonistic eccelesiastical movements and struggles of the West. This mediate and mediating attitude of Lutheranism appears "in its fundamental conception of the essence of Christianity as the union of the divine and human, of which the prototype is found in the person of Christ, in the Scriptures, etc. In the various ways in which this union is conceived lies the deepest and most inward ground of the divergence which exists between the three Western churches. The Catholic Church wishes to *see* the union of the divine and human; the Lutheran wishes to *believe* it; the Reformed wishes to *understand* it." Lutheranism, guarding against any confusion as well as separation of the divine and the human, views their union as "the most vital, rich, and inward communion, interpenetration, and reciprocity." So it discerns the presence of the Spirit in human and ecclesiastical developments, accepting what is normal, rejecting what conflicts with Scripture. In the person of Christ it affirms the perfect humanity and the perfect divinity in the living union and reciprocal communication of the two natures. In the sacraments it comprehends the objective divine gift which heavenly grace presents in earthly elements, as well as the subjective condition which determines its saving or its condemning efficacy.

All evangelical Protestantism rests upon the formal and the material principles of the Reformation (i.e. the word of God and justification by faith); yet the attitude of Lutheranism toward both is peculiar. It lays more stress than others on the exclusive authority of the Scriptures. It attaches no more weight to the inner light or to reason than to tradition or the decisions of the Church. It cleaves to the word not only as the sole authority revealing the will of God, but as a means of grace, an instrument for the inward action of the Spirit. It views the Scriptures not only as inspired, but inspiring, possessing not only a normative, but also a dynamic character. In other Protestant systems "the sole office of the word is to point the way of life." In Lutheranism "it communicates that whereof it treats."

The exaltation of the sacraments characteristic of Lutheranism grows out of its estimate of the word. The chief constituent of the sacraments is the word. They are the visible word, the word crystallized into a rite. "Baptism is not simply water, but the water comprehended in God's command and connected with God's word," and its saving effects are "produced by the word of God, which accompanies and is connected with the water, and by our faith which relies on the word of God connected with the water." So with its distinctive doctrine of the Lord's Supper. The 'great effects' of the Supper are ascribed to the words connected with its institution: "given and shed for you for the remission of sins," which words are besides the bodily eating and drinking the chief things in the sacrament.

The word is accordingly determinative in everything pertaining to the Church or to the individual Christian. Whatever in tradition or usage conflicts with the word is renounced, whatever embodies or emphasizes the word remains. Such Church festivals are observed as commemorate the fundamental facts of redemption recorded in the Word. The liturgy, pruned of everything which taught or insinuated unsound doctrine, is retained, since it "aims at expressing and appropriating in due order and in their organic connection the various parts of the one Word of God." From the doctrine of a spiritual priesthood follows logically the participation of the people in all public worship. Lutheranism furnishes, therefore, a prescribed order which in its chief parts is the same everywhere, but which neither in whole nor in part is made obligatory on congregations. Art in the sanctuary is not discarded. The symbolic arrangement and decoration of God's House is encouraged so far as art is expressive of the Gospel and impressive as an aid in exciting and deepening faith in it.

By the word likewise is determined the limit of the ministerial office, which consists in the proclamation of the Gospel and the dispensing of the sacrament. What the word offers, and only that, in its infinite application to human needs, is the theme of the pulpit. Its inherent power works repentance, faith, and obedience. With this ends the scope of the sacred office, and the authority of the Church, from which its ministers and shepherds derive all their functions. Nothing can be bound on men's consciences which God's word does not bind, nothing can be loosed therefrom which God's word does not loose.

By the word also is determined the polity of the Church. Lutheranism finds no form of ecclesiastical government instituted in the New Testament, but as the spiritual priesthood and equality of believers is there established, any polity is approved which safeguards the rights of all and vests final authority in the congregation. In Scandinavian countries the episcopate remains. In German lands the Consistorium, the spiritual cabinet of the State government, has the supreme supervision. In the United States there are a number of synods and general bodies and government varies from Congregational to Presbyterian types.

In the word Lutheranism finds the effective instrument of social reform. By it are set all boundaries in ethics. To this test is subjected every plan for moral amelioration, and in this is recognized the sole basis for Church unity. The true unity of the Church is found solely "in agreement concerning the doctrine of the Gospel."

And this magnifying of the word determines the attitude of Lutheranism toward modern thought and criticism. Whatever may be found true in the pretensions of scientific conclusions, God's word cannot oppose. And whatever unquestionably contradicts that word must be opposed and overcome. Lutheranism would be false to its principles should it assume any other position; yet in the conflict between the old and the new, the Lutheran Church has a singular advantage in this, that none of its symbols either prescribe the canon of Holy Scripture or define inspiration.

The material principle of Protestantism holds also a unique rank in Lutheranism. While justification by faith alone has a place in all Reformed confessions, it is the centre of the Lutheran system. Luther calls it "the one article and rule in theology, into which come and go all the others, and without it all the others are nothing." The Augustana strikingly exhibits the central, regulative, organic position of this doctrine "in the middle of the confession as its constructive centre," the preceding articles forming the objective background, those following relating to its instrumental cause, its fruit in the individual, and its import for the Church.

The contention of Lutherans for the Real Presence in the Eucharist, "the most conspicuous divergence" from the Reformed, is not inconsistent with this preëminence of justification, for the sacraments were ordained chiefly "that they should be signs and testimonies of the will of God toward us, set forth to excite and confirm faith in such as use them." The Holy Supper with its supernatural content is the tender, the application to the individual, of the promise of justification, the means for its appropriation. Christ thereby "especially confirms the certainty of the promise of the Gospel to every one that believeth" (Formula of Concord), "adding as the memorial of so great a promise His own body and blood in the bread and wine" (Luther). The designation of this doctrine as consubstantiation is repudiated by Lutheran theologians. That term implies the commingling of body and blood with bread and wine so as to form one substance, but Lutheranism denies all change of elements in the sacramental union of the heavenly and the earthly, which is limited to the fruition, and which faith receives unto salvation, unbelief unto condemnation.

Closely connected with its doctrine of the Real Presence, though not originally developed as a defense of it, Lutheranism has another distinctive doctrine in its explanation of the *communicatio idiomatum*. According to its interpretation by the early councils and in opposition both to Roman Catholic and Reformed teachings, it developed the reciprocal relations of the two natures in the personal union, viewing the human and the divine in Christ as inseparable yet unconfused, and ascribing all redemptive offices of the one person both to the human and the divine constituents, the divine personality acting, suffering, rising from the dead and reigning in both natures.

PRACTICAL LIFE. Such confidence in the power of the word and such stress laid on solafidianism, it has been objected, are unfavorable to religious earnestness. The abuse of these principles doubtless is, but the record of Lutheranism is on the whole one of faithful attention to spiritual interests. By its catechisation this Church trains its children in Christian faith and life, maintaining in the spiritual realm a standard of education akin to the system of general education which prevails in Lutheran countries. Missions to the heathen were confessedly impracticable for Protestants in the Reformation age, yet as early as 1559 Gustavus Vasa established a mission among the Lapps in Northern Sweden. Others carried evangelical doctrines into Russia. King Frederick IV. of Denmark sent out missionaries to India, and Ziegenbalg and Plütschau sailed for Tranquebar in July, 1706, almost a century before the formation of English missionary societies. Lutheran Halle became the centre of foreign mission activity. A colony of Swedes, which settled along the Delaware River in 1636, were the first Protestants to come to America with the express object of evangelizing the aborigines, and one of its clergymen, John Campanius, by his translation of Luther's catechism, made the first effort at publication in an Indian tongue. Although Lutheran Europe lacks the wealth of England and America, and although Lutheran contributions in this country fall below those of some other churches, yet foreign missions are zealously prosecuted by nearly all American Lutheran bodies, and European Lutherans maintain a number of powerful societies: the Berlin, the Leipzig, the Rhenish, the Bremen, the Gossner, the Basel, the Hermannsburg, the Norwegian, the Swedish, the Danish, etc., whose missionaries are laboring in every quarter of the heathen world. (See MISSIONS, CHRISTIAN.) The Lutherans of Europe have had a peculiar and enormous task in following everywhere the streams of emigration with the ministry of the word. For the purpose of training pastors for this work eleven seminaries are supported in Germany by voluntary offerings. Another peculiar work is done by the Gustav Adolph Verein, an association with more than one thousand branches, which gives aid to the Diaspora, i.e. Protestants living in Roman Catholic communities. Its income, in 1901, was $500,000. There is also considerable activity in Jewish missions; the work of the "Inner Mission" in Germany has recently grown to be a mighty power in protecting and rescuing the imperiled members of the Church; philanthropic institutions of every description are numberless; and societies abound for the distribution of the Scriptures. The Canstein Bible Institute was founded at Halle in 1710, a hundred years before the British Foreign Bible Society.

HISTORY. The most notable external event in the history of Lutheranism, after the triumph of the Reformation in 1555, was the forcible transference, a few years later, by the civil authorities, of the churches of the Palatinate, Bremen, and Anhalt to the Reformed communion. The immediate cause of this was a strenuous endeavor to force an accommodation between the Lutheran doctrine of the actual participation in Christ's body and blood in the Eucharist, and Calvin's view of a spiritual enjoyment of Christ's body and blood by faith. It was the first endeavor for denominational union and resulted in rending the Lutheran body. A similar zeal for a union of the evangelical forces, inspired by the determination to hold the differences between the Lutherans and the Reformed as non-essential, in the seventeenth century, wrested the Landgraviate of Hesse-Cassel and the Court (though not the people) of the Electorate of Brandenburg from Lutheran principles. Luther's catechism was forbidden in the former country, the Reformed worship was introduced, and recalcitrant pastors were banished and replaced by Calvinists. The tendency toward union led to numerous conferences (Leipzig, 1631; Thorn, 1645; Cassel, 1661), the main issue in dispute being always the distinctively Lutheran doctrine of the Lord's Supper. The champions of union sought agreement in the use of a formula which, while recognizing the Lutheran view, admitted a Calvinistic interpretation. The result of these efforts as well as of the two edicts of the Great Elector of Brandenburg (1662, 1664) was the widening rather than the healing of division.

The eighteenth century witnessed the decay of Pietism, which, after it had quickened every spiritual interest, left a harvest of narrowness and cant, of hazy emotion and sectarian fanaticism. Pietism was followed by the sway of Rationalism, which, by its assault on the doctrines of Christianity, threatened to poison the Church's heart and paralyze all its activity.

The most notable event of the nineteenth century was the edict of Frederick William III., which in 1817 united the Lutheran and the Reformed of Prussia in one State Church, i.e. under one system of government, while each denomination adhered to its own confession, a measure followed by several other German States. The Reformed as a body have as a result almost disappeared, while Lutheranism has been modified by a Reformed leaven. For further details concerning European Lutheranism, see the articles on Lutheran countries and the biographical sketches of Lutheran leaders; see also the article GERMAN THEOLOGY.

LUTHERANISM IN THE UNITED STATES. *History.*—Dutch Lutherans came to America with the first settlers on Manhattan Island in 1623, but the services of a pastor were denied them until the English occupation in 1664. Swedish Lutherans settled on the Delaware in 1637 and 1642, bringing with them explicit instructions not to disturb the exercise of the Reformed religion. The Germans began to arrive early in the eighteenth century, and soon in large numbers, but they were long destitute of pastors and had but few, feeble, and scattered organizations prior to the arrival of Heinrich Melchior Mühlenberg (q.v.) in 1742. He was followed by a number of consecrated and educated men from Halle, under whom the Lutheran Church attained influence far and wide. A synod was organized in Pennsylvania in 1748, one in New York in 1786, one in North Carolina in 1803, and one in Ohio in 1818. The ravages of two wars left the Church in a state of desolation. Then followed the problem of a transition to English worship, the strenuous and persistent opposition to which caused immeasurable injury to the Church, alienating the younger and more progressive elements, barring the establishment of educational institutions, and putting her at a serious disadvantage, especially in the cities.

ORGANIZATIONS. Lutherans in the United States are divided among a number of distinct bodies. The *General Synod*, aiming at a union of all Lutherans, was founded in 1820. It failed to unite all bearing the name, but from its organization a new era opened for the whole Church. It gave the impulse and support for ecclesiastical, educational, and missionary activities. Its constituency increased steadily, and in 1860 it embraced 26 synods. During the Civil War the synods south of the Potomac withdrew. From these has been evolved the *United Synod of the South.*

A more serious rupture occurred in 1866, growing out of the friction of two parties, the one seeking stricter adhesion to distinctively Lutheran doctrine and aiming at the formation of a union that should comprehend the large Lutheran synods which German and Scandinavian immigrants had organized here, the other party allowing wider latitude and being more intent on fraternal relations with other denominations than on union with Lutherans of exclusive principles. Several of the older and larger synods, withdrawing from the General Synod, effected the organization of the *General Council* in 1867, with which body all of the Swedish churches and a number of Germans connected themselves.

The confessional basis of the General Council is stated to be "the doctrines of the unaltered Augsburg Confession in its original sense as throughout in conformity with the pure truth of which God's word is the only rule." To this is attached the declaration that "the other Confessions of the Evangelical Lutheran Church [The Apology, the two Catechisms of Luther, the Schmalkald Articles, and the Form of Concord], inasmuch as they set forth none other than its [the Augustana's] system of doctrine and articles of faith. are of necessity pure and Scriptural." The doctrinal basis of the United Synod of the South is essentially identical with this. That of the General Synod reads: "We receive and hold, with the Evangelical Lutheran Church of our fathers, the word of God as contained in the canonical Scriptures of the Old and New Testaments as the only infallible rule of faith and practice, and the Augsburg Confession as a correct exhibition of the fundamental doctrines of the divine word, and of the faith of our Church as founded upon that word." By unanimous resolutions the body has designated the Unaltered Augustana as its basis, declared it to be "throughout in perfect consistence" with the word of God, and repudiated "any distinction between fundamental and so-called non-fundamental doctrines in the Confession." Amicable relations obtain between these three general bodies.

The largest American body of Lutherans is the *Synodical Conference*, whose chief constituent, the Missouri Synod, has had remarkable growth. It was developed from several colonies of Saxons who were driven into voluntary exile by the sway of Rationalism and who, in January, 1839, settled in Saint Louis and vicinity. In 1841 they chose as their leader the Rev. C. F. W. Walther, under whose guidance theological seminaries, colleges, and charitable institutions sprang into existence, congregations rapidly multiplied, and periodicals and other literature were published. The organization of a synod was effected in 1847. Its constitution makes "the acceptance of all the symbols of the Lutheran Church, absence of every kind of syncretism, mixed congregations, mixed worship and communions, etc., etc., conditions of membership in this body." Each congregation maintains a parochial school. The extension of its work over almost the entire country soon called for a division of the body into districts, which now number thirteen. In 1872 the Joint Synod of Ohio, with several smaller German synods and a Norwegian synod, united with 'Missouri' in the formation of the Synodical Conference. The most important practical work carried on conjointly by this general body is an extensive mission among the negroes of the South.

The *Joint Synod of Ohio*, which before its connection with the Synodical Conference had maintained an independent existence for half a century, withdrew from this general body in 1881 on account of the doctrine of predestination which prevailed in the Conference. It is divided into ten districts.

The *Synod of Iowa* is a large German body, founded in 1854, mainly by missionaries whom Löhe of Neuendettelsun sent to this country. It antagonizes 'Missouri' mainly on the doctrine of the Church and the ministry, 'Iowa' holding that the ministerial office "was given to the Church in its totality, ... and that the Church possesses the office in and with the means of grace, not in the spiritual priesthood."

A number of smaller divisions of Norwegian Lutherans were merged in 1889 in one organization under the title *The United Norwegian Lutheran Church*, embracing about one-fourth of the entire Norwegian population of America.

There are three independent Norwegian bodies, five independent German bodies aggregating 100 ministers and 21,000 members, two Danish synods, one Finnish, and one Icelandic. There are 85 congregations, mostly German, embracing 25,000 members without synodical connections. The General Synod is mostly English; the United Synod of the South entirely so; the General Council Synodical Conference and the independent synods have but a small percentage of English churches.

CHURCH POLITY. All Lutherans recognize the congregation as the primordial and formative unit of ecclesiastical organization. It is the source of whatever authority is exercised by the representative bodies, and the final court of appeal. Congregations have formed themselves into synods for the sake of mutual assistance and oversight; but the synods have no power except that which the congregations have voluntarily conferred upon them.

Yet no Lutheran body in America can be said to be strictly or purely congregational. The Missourians adhere to this polity more closely than others, excepting perhaps the Joint Synod of Ohio, their congregations remaining independent and self-governing. A synod was organized by pastors and lay delegates as representing congregations, no others having a vote, but the synod has no legislative or judicial power over the congregations, which decide all matters pertaining to themselves in congregational meetings. The synod is merely an advisory body, all synodical action, even the election of theological professors, requiring ratification by the congregations. All this holds, of course, in the case of the general body, the Synodical Conference, formed by the Missouri Synod with several other synods.

The General Synod, the General Council, and the United Synod of the South, without impugning the sovereignty of the congregation, have to some extent followed Presbyterian polity, the congregations delegating a variable measure of authority to the synod. Lay eldership generally obtains, but not as of divine warrant. The clergy with the lay deputies—who may be other than elders—form synods, which prescribe the essentials of a constitution required of congregations seeking membership, exercise a degree of oversight over them, and have full authority over ministers. The general bodies, in which a number of synods have united, determine respectively the confessional requirements made of ministers in their connection, and the publication of catechisms, hymnals, and liturgies used within their bounds.

Cases may arise where congregations are subjected to discipline for disregarding synodical action, but if they see fit to dissolve their connection with one general body and unite with another, or assume an independent relation, they do not lose their Lutheran character.

THE COMMON SERVICE. The Lutheran Church uses fixed forms of worship. While it does not regard them as essential, or hold uniformity in rites and ceremonies necessary to the true unity of the Church, the desirability of a common form for all congregations was recognized by Luther and his colleagues. Various circumstances in the United States contributed to a striking diversity of forms not only in the different bodies, but in different congregations connected with the same body. This was widely deprecated as an evil, and the bodies embracing the American element agreed in 1881-83 to unite in the preparation of a Common Order of Service "on the basis of the common consent of the pure Lutheran liturgies of the sixteenth century." The result, under the name of *The Common Service*, was unanimously adopted by each of the three bodies, the General Synod, the General Council, and the United Synod of the South, along with the statement: "If at any time or place the use of the full service is not desired, it is in entire conformity with good Lutheran usage that a simpler service may be provided and used, in which only the principal parts of the service in their order are contained." The English Synod of Missouri has since adopted the same service, as have also the Norwegian-English churches.

The service begins with the *Confession of Sins* and the *Declaration of Grace*, by which all worship is grounded on the atoning sacrifice. Then follow the *Introit* with the *Gloria Patri*, the *Kyrie*, the *Gloria in Excelsis*, the *Salutation* and the *Response*, the *Collect*, the *Epistle* and the *Gospel*, the *Creed*, the principal *Hymn*, the *Sermon*, the *Offertory*, the *General Prayer*, culminating in the *Holy Communion*. The Common Service contains also an order for vesper services and for matins, consisting of psalmody, lessons from the Holy Scriptures, and prayers. The *Magnificat* and *Nunc Dimittis* belong to the evening service, the *Te Deum* and *Benedictus* to the service for the morning.

THEOLOGICAL SEMINARIES. Lutherans maintain a high standard of ministerial education. Thorough indoctrination is held to be an essential prerequisite for preaching. Not less than twenty-five theological seminaries are found in this country. Their professors are bound by the confessional requirements of the respective synods by which they are supported, and doctrinal and exegetical theology receives chief attention. Some of them have a meagre equipment and quite a number are connected with preparatory schools. Eleven are English, others are German or Scandinavian, and not a few are bilingual. The leading institutions are: (1) The Seminary of the General Synod, located at Gettysburg, Pa., founded in 1826. The General Synod chose as the first professor Rev. Samuel S. Schmucker. Its curriculum covers the usual course of three years' resident study, requiring the degree of A.B. for admission, and it has two special courses leading up to the degree of B.D. Besides lectureships, there are five regular professorships.

(2) Wittenberg Seminary, a literary and theological institution founded at Springfield, Ohio, in 1842, for the education of young men for the ministry of the Evangelical Lutheran Church. It is supported by five synods connected with the General Synod. The course of study covers three full years under three regular professors. For a long time Rev. Samuel Sprecher, D.D., LL.D., stood at the head of this school.

(3) Concordia Seminary. The most largely attended Lutheran theological seminary is the Concordia, located at Saint Louis, Mo., which was established at Altenburg in that State in 1839 by a number of Saxon pastors and congregations. With the organization of the Missouri Synod it was transferred to Saint Louis. There are six regular professors. For more than a generation Rev. Carl F. W. Walther stood at the head of this institution.

(4) The Practical Seminary of the Missouri Synod was formerly an adjunct of the Saint Louis Seminary, following an abridged curriculum, the same professors lecturing to the students of both seminaries; but in 1875 it was removed to Springfield, Ill. It maintains five professors, with an attendance of over 100 students.

(5) The Mount Airy Seminary, Philadelphia, was established in 1864, under the guidance of men who were identified with the Gettysburg Seminary, but who were dissatisfied with Dr. Schmucker's type of theology and with the failure of that school to make adequate provision for the wants of German congregations. The seminary was opened in October, 1864. In 1889 it was removed to Mount Airy, on the northern edge of the city. The seminary is under the care of the Synod of Pennsylvania, the Synod of New York coöperating.

(6) The Augustana Theological Seminary was established by the Augustana Synod (Swedish) at its organization in 1860. It was located in Chicago, with Rev. L. P. Esbjörn as president and regular professor. In 1863 it was transferred to Paxton, Ill., with Rev. T. N. Hasselquist at its head. In 1875 it was united with Augustana College at Rock Island, Ill., the professors in that institution teaching also theological branches in addition to the three regular professors. In the seminary the Swedish and English languages are used about equally, and most of the graduates of recent years are able to preach both in English and Swedish.

(7) The Chicago Seminary was chartered in 1891. The directors, originally appointed by the General Council, are a self-perpetuating board, whose successors are chosen from synods in strict harmony with the doctrinal position of the seminary—which is the same as that of the General Council. The institution owes its existence to the zeal and liberality of the late Rev. W. A.

Passavant, who was the first president of the board of directors.

(8) The Seminary of the Joint Synod of Ohio has been in operation, with brief intermissions, since 1830. It is under the general supervision of the Synod and under the special control of a board of directors. It is locally united with Capital University, at Columbus, Ohio, and for entrance students must have completed a regular college course. The confessional position has long been that of a strictly conservative type.

(9) The Norwegian Augsburg Seminary is the oldest Norwegian divinity school in America. It was founded at Marshall, Wis., in 1869, and transferred to Minneapolis, Minn., in 1872. Its first president was Prof. A. Weenas.

(10) The United Church Seminary, at Minneapolis, Minn., is the divinity school of the United Norwegian Lutheran Church, founded in 1890, at which time the United Church was organized by a union of three Norwegian synods. It has three professors.

(11) The Wartburg Seminary, the theological institution of the German Synod of Iowa, was founded by Pastor Loehe, of Germany, at Saginaw, Mich., in 1852, as a teachers' seminary for the Missouri Synod. In view of the rupture with that body it was in 1854 transferred to the Iowa Synod, just organized, and transformed into a theological seminary. After sundry removals the institution was finally located at Dubuque, Ia. In 1854 and 1857 Loehe sent over as professors the brothers S. and G. Fritshel, accomplished and pious scholars, who gave the institution a high standard and engaged in vigorous warfare with Walther on the derivation of the ministerial office, chiliasm, and other questions. There are four regular professors, one of whom gives all his instruction in the English tongue.

(12) The Theological Seminary of the United Synod of the South is located at Mount Pleasant, S. C., near Charleston. It dates its beginning from the establishment of a theological institution by the Synod of South Carolina in 1830 and has had a checkered and intermittent history. It was located at Lexington, S. C., from 1833 to 1853, and conducted by Rev. E. L. Hazelius. For some years it was merged into the General Seminary of the Church South. When that was discontinued the South Carolina Synod resumed its own theological instruction at Newberry, S. C., until the United Synod located this institution permanently in 1898 at Mount Pleasant.

STATISTICS. The following are the figures for Lutheranism at the beginning of the year 1903:

COUNTRIES	Ministers	Congregations	Communicants
The United States			
General Synod	1,238	1,625	211,500
General Council	1,305	2,106	364,400
Synodical Conference	2,225	3,585	633,000
United Synod of the South	215	441	41,500
Joint Synod of Ohio	490	650	87,314
German Synod of Iowa	451	856	78,540
Norwegian United Church	376	1,191	142,231
Independent synods and independent congregations	816	1,420	310,017
Total for United States and Canada	7,116	11,874	1,868,502

COUNTRIES	Ministers	Congregations	Communicants
Europe			
German Empire	17,850	23,220	35,843,200
Denmark (including Iceland and Faroe Islands)	1,905	2,240	2,628,800
Norway	920	1,069	2,282,000
Sweden	2,893	2,514	5,262,125
Finland	950	1,022	2,625,000
Russia (proper)	588	1,814	3,920,000
Austria	310	720	375,400
Hungary	1,230	1,472	1,230,000
Rumania	13	38	20,000
Other Balkan States and Turkey	5	13	5,700
Italy	12	26	11,500
Switzerland	8	10	82,000
Spain and Portugal	6	12	2,600
France	135	93	91,500
Belgium	10	11	23,000
Holland	72	70	98,000
England	32	51	245,000
Scotland, Ireland, and Wales	10	31	15,000
Total in Europe	26,949	34,426	54,760,825
Asia			
Caucasia	24	102	45,000
India	285	1,140	156,000
Burma, Ceylon, and Siam	5	9	6,500
China	110	152	12,000
Japan	5	4	1,350
Siberia	11	26	26,000
Asia Minor, Palestine, and Persia	23	33	6,500
Total in Asia	463	1,466	253,350
Africa			
Algeria	10	40	5,000
Egypt, East and Central Africa	70	85	3,600
South Africa	245	513	183,600
West Africa	95	254	20,950
Madagascar	135	800	110,000
Total in Africa	555	1,692	323,150
Oceanica			
Australia	114	267	113,000
New Zealand	13	20	12,800
New Guinea and Borneo	24	27	2,850
Sumatra and Nias	88	186	44,030
Java and Hawaii	2	5	3,150
Total in Oceanica	241	505	175,820
South America			
Brazil	77	168	395,000
Argentina	8	20	77,000
Chile	11	23	46,000
Other South American States	13	25	12,500
Total in South America	109	236	530,500
North America			
Greenland	15	17	10,015
Alaska, Cuba, and Mexico	7	8	5,500
United States and Canada	7,116	11,874	1,868,502
Total in North America	7,138	11,899	1,884,017
Grand total for the world	35,455	50,224	57,927,662

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LUTHER LEAGUE, THE. An organization formed at Pittsburg, Pa., in 1895. Its basis is the unaltered Augsburg Confession and "it receives into membership any society of whatever name connected with a Lutheran congregation or a Lutheran institution of learning. It holds biennial conventions, and its interests are committed to an executive committee and to a statistical secretary, who promotes the organization and growth of local societies." Its organ, *The Luther League Review*, is published monthly in Washington, D. C. In 1900 it reported a membership of 50,000, distributed through twenty different States. Consult Bacon and Northrop, *Young People's Societies* (New York, 1900).

LUTHER'S HYMN. The name given to the famous hymn by Luther, "Ein feste Burg ist unser Gott," published in 1529.

LUTI, lo͞o'tē, BENEDETTO (1666-1724). An Italian painter, born in Florence, pupil of Gabbiani. Intending to continue his studies under Ciro Ferri, he went to Rome, but that master having just died, Luti applied himself to studying his works and those of other good masters, and formed for himself a style which may be considered a compound of various imitations. He enjoyed great reputation in Rome as a painter in fresco and in oil, was honored with commissions by Pope Clement XI., and was knighted by the Emperor. The more rigid critics were wont to call him the last painter of the Florentine school. In the Uffizi Gallery, Florence, may be seen his "Finding of Moses" and a portrait of himself; in the Louvre, "The Magdalen;" and at Cassel, "The Virgin Reading," one of his most charming creations. Others are in the galleries of Darmstadt, Munich, Dresden, and Saint Petersburg, and the "Vestment of Saint Ranieri" is the most admired among the larger paintings in the cathedral at Pisa.

LÜTKE, lụt'ke, FEODOR PETROVITCH, Count (1797-1882). A Russian navigator and explorer. He was educated for the Russian naval service, and in 1817-19 was an associate in a Russian expedition around the world. From 1821 to 1825 he made a series of exploratory journeys to the coasts of Kamtchatka and Nova Zembla. In 1826-28, commanding the fourth Russian voyage of circumnavigation, he explored the coasts of Siberia and Russian America. Appointed admiral in 1855, he was subsequently employed in conspicuous service. In 1845 he assisted in the establishment of the Russian Geological Society, and in 1864 was president of the Academy of Sciences at Saint Petersburg. His principal published work is his *Four Voyages Across the Arctic Seas* (1824).

LUTON, lo͞o'ton. A market-town in Bedfordshire, England, 30 miles northwest of London, on the river Lea (Map: England, F 5). The chief buildings are the Plait Hall, town hall, corn exchange, and a fine fourteenth-century parish church. It owns baths, a free library, markets, parks, remunerative real estate, provides technical instruction, and maintains a fire brigade and electric lighting. Refuse and sewage are treated for fertilizing purposes. It is the chief English seat of straw-plaiting manufactures for hats, bonnets, etc., employing several thousand persons. This industry was established by James I. by the transplantation from Scotland of Lotharingian artisans who had settled in that country. Luton has also felt-hat works and brass and iron foundries. Population, in 1891, 30,000; in 1901, 36,400. Consult Davis, *History of Luton* (Luton, 1855).

LUTTER AM BARENBERGE, lut'tẽr am bä'ren-bĕrᴋ-e. A small town of the Duchy of Brunswick, in the Circle of Gandersheim. It is noted for the victory gained there in the Thirty Years' War by the Catholic general Tilly over Christian IV. of Denmark, August 27, 1626.

LUTTEROTH, lụ'te-rōt, ASCAN (1842—). A German landscape painter, born in Hamburg. He was a pupil of Calame at Geneva (1861-64), and of Oswald Achenbach at Düsseldorf (1864-67). After completing his studies in Rome in 1868-70, he settled in Berlin, and in 1877 removed to Hamburg, where he became professor in 1891. His pictures, chiefly of Italian scenery, remarkable for coloristic splendor, exquisite light effects, and pervaded by a poetical atmosphere, include: "Isola bella" (1884, Hamburg Gallery); "Evening on the Mediterranean" (1886, National Gallery, Berlin); "The Mavensi" (1889, Leipzig Museum); and "Lago Maggiore" (1894).

LUTTI, lụt'tē, FRANCESCA (1831-78). An Italian poetess, born at Campo, near Trent, Tyrol. She is chiefly remembered as the author of certain tales in verse, including *Novelle e liriche* (1862); *Alberto* (1867); *Giovanni; Rosa e Stella; Maria;* and *Un proverbio*. She died at Brescia.

LUT'TRELL, HENRY (1765?-1851). An English writer of society verse. He was a frequent guest at Samuel Rogers's famous breakfast parties and at Holland House; and whatever the company he always shone brilliantly. Scott called him 'the great London wit.' He published a delightful society epic entitled *Advice to Julia, a Letter in Rhyme* (1820, enlarged 1822), resembling in theme and style Gay's *Trivia*.

LÜTTRINGHAUSEN, lụ'trĭng-hou'zen. A town in the Prussian Rhine Province, Germany, 5 miles southeast of Elberfeld (Map: Prussia, B 3). It has a fifteenth-century Gothic church and a monastery. The town has important manufactures of textiles, iron and steel, etc. Population, in 1900, 11,261, chiefly Protestants.

LÜTZELBURGER, lụ'tsel-bo͞orᴋ'ẽr, HANS (called HANS FRANCK) (c.1495-1526). A German wood-carver, born in Augsburg. He was active in Basel, whither he appears to have gone with Holbein in 1522. Holbein's chief works, particularly the illustrations for the Old Testament and the "Dance of Death," were done into wood by him. Other examples of his art are two poniard-sheaths, a portrait of Erasmus, "Christ as the True Light," "Christ Bearing the Cross," and "The Sale of Indulgences." His designs are correct and elegant, and he is probably to be regarded as the most important wood-carver of the

German Renaissance. One of his three "Dance of Death" alphabets was imitated by Lödel at Göttingen in 1894.

LÜTZEN, lụ'tsen. A small town in the Prussian Province of Saxony, 10 miles southwest of Leipzig, with 3838 inhabitants in 1900. It is famous for two battles fought in its vicinity. The first battle of Lützen was fought in the course of the Thirty Years' War, between Gustavus Adolphus, King of Sweden, and Wallenstein, commander-in-chief of the Imperial forces, on November 16 (old style, November 6), 1632. At the end of September Gustavus Adolphus had been compelled to leave Nuremberg, having been starved out by Wallenstein. The latter marched northward to force the wavering Elector of Saxony, John George, to join the Imperialist cause. Gustavus Adolphus hurried after him, united his forces with those of Duke Bernhard of Saxe-Weimar, and attacked Wallenstein. The Swedes numbered about 15,000 men; Wallenstein had approximately 25,000. The battle was contested with great stubbornness on both sides. Gustavus Adolphus was killed early in the day. Night finally put an end to the battle, the Swedes remaining masters of the field. Each side is said to have lost about 10,000 in killed and wounded. Consult: Droysen, "Die Schlacht bei Lützen," in *Forschungen zur deutschen Geschichte* (Göttingen, 1862); Dodge, *Gustavus Adolphus* (Boston, 1895). (See GUSTAVUS I. ADOLPHUS; THIRTY YEARS' WAR; WALLENSTEIN.) The second battle of Lützen took place on May 2, 1813, a little to the south of the site of the first battle, between the French under Napoleon and the Russo-Prussian army under General Wittgenstein. Napoleon was victorious, but, as he had no cavalry with which to pursue, his victory brought him little benefit. Each side lost about 20,000 men. Consult Sloane, *Life of Napoleon Bonaparte*, vol. iv. (New York, 1896). See NAPOLEON I.

LUTZK, lo͞otsk (Pol. *Luck*). An old town in the Government of Volhynia, Russia, situated on the Styr, about 120 miles southeast of Lublin. It was the capital of an independent principality in the Middle Ages and a place of great commercial importance. It passed to Lithuania and later followed the fortunes of Poland. In recent times it has been fortified. Population, in 1897, 18,525.

LÜTZOW, lụ'tsō, ADOLF, Baron (1782-1834). A German soldier, remembered as the leader of a famous volunteer corps in the War of Liberation. He was born in Berlin, entered the Prussian Army in 1795, retired as major in 1808, but was restored to active service in 1811, and in February, 1813, was authorized to organize a corps of volunteers, destined to carry on a guerrilla warfare in the rear of the enemy. The corps was named after Lützow and known also, from its uniform, as the 'Black Troop,' or 'Black Riflemen.' It distinguished itself especially in the engagement around the Göhrde Forest, where Lützow was severely wounded. Having rejoined the army in France, he was taken prisoner in March, 1814, and, his corps being disbanded after the conclusion of peace, he received command of a cavalry regiment. Captured again in the battle of Ligny and delivered at Belle-Alliance, he was appointed colonel and in 1822 promoted to major-general. The valor of the Black Troop is commemorated in the poem "Lützows wilde, verwegene Jagd," by Theodor Körner (q.v.), who, as Lützow's adjutant, met his death in battle.

LÜTZOW, KARL VON (1832-97). A German art-historian and critic, born at Göttingen. He studied philology and archæology at Göttingen and Munich, and was associated in Berlin with Lübke in editing *Denkmäler der Kunst*, established himself as a lecturer in Munich in 1858, then edited in Vienna the *Recensionem und Mittheilungen über bildende Kunst*, and in 1864 became docent of art-history at the Academy, where in 1866 he was also made librarian and custodian of the cabinet of engravings. In 1867 he was appointed professor at the Polytechnicum. His valuable publications include: *Die Meisterwerke der Kirchenbaukunst* (2d ed. 1871); *Die Geschichte der kaiserlich-königlichen Akademie der bildenden Künste* (1877); *Die vervielfältigende Kunst der Gegenwart* (1886 et seq.); *Die Kunstschätze Italiens in geographisch-historischer Uebersicht geschildert* (2d ed. 1900); and *Geschichte des deutschen Kupferstichs und Holzschnitts* (1891). He founded the *Zeitschrift für bildende Kunst* (1866 et seq.), of which he was editor up to the time of his death.

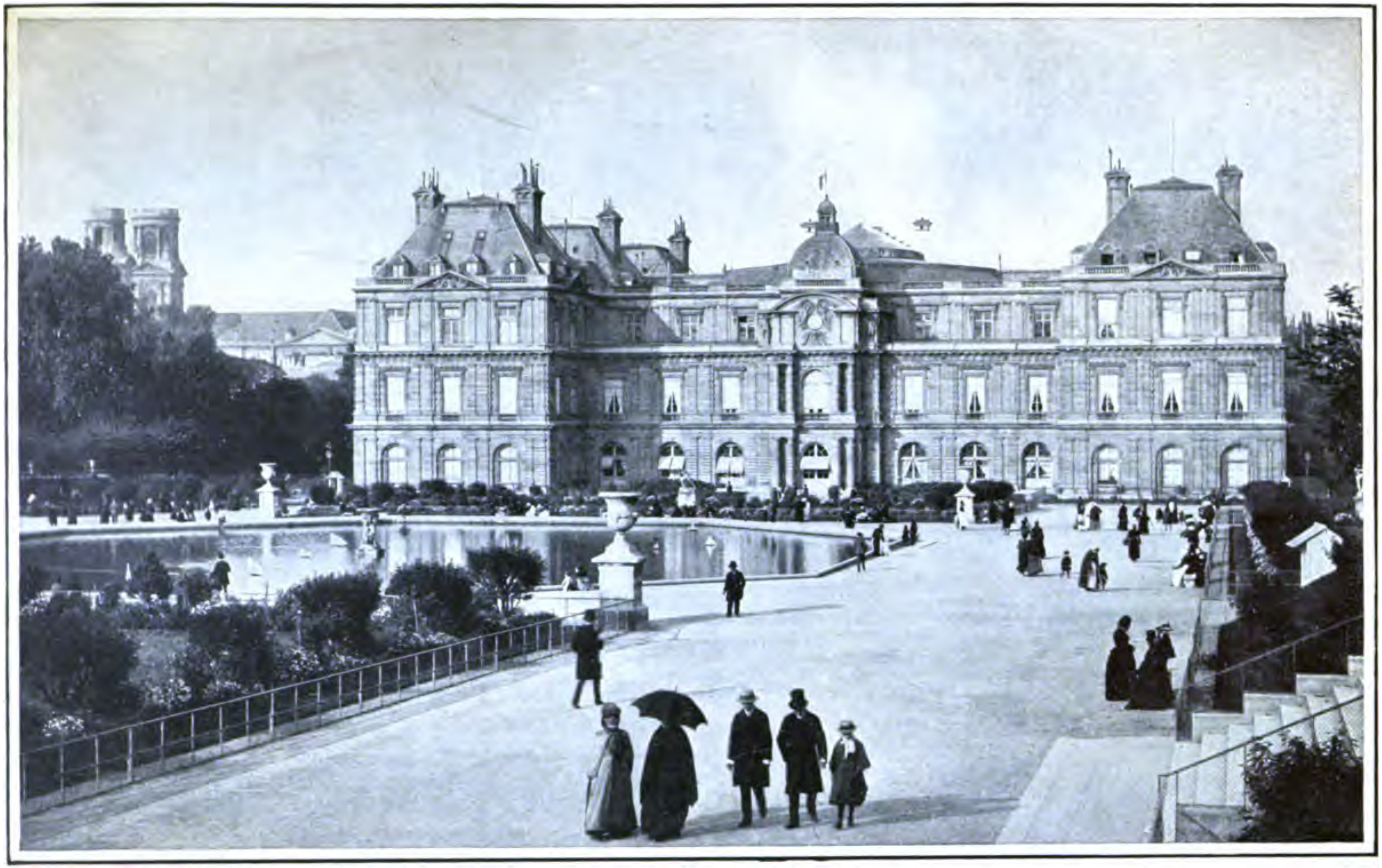
LÜTZOW, THERESE VON (1804-52). A German author. She was born at Stuttgart, subsequently removed to Hamburg, and finally to Saint Petersburg, where her father, H. von Struve, was ambassador. She accompanied her second husband, Colonel von Lützow, to Java, where she died. Her chief publication is the correspondence between Wilhelm von Humboldt and her friend Charlotte Diede, under the title *Briefe an eine Freundin von Wilhelm von Humboldt* (1847; 12th ed. 1891). Her other works include society novels, such as *Lydia* (1884) and *Weltglück* (1885), and several interesting volumes of travel.

LUVERNE, lo͞o-vĕrn'. A village and the county-seat of Rock County, Minn., 200 miles southwest of Minneapolis; on the Rock River, and on the Chicago, Rock Island and Pacific and the Chicago, Saint Paul, Minneapolis and Omaha railroads (Map: Minnesota, B 7). It has a fine court-house and a public library of about 2000 volumes. The village is surrounded by an agricultural district, and there are granite-quarries, grain-elevators, a flour-mill, creamery, brickyard, etc., and important nursery and stock-breeding interests. Population, in 1890, 1466; in 1900, 2223.

LUX, lụks, FRIEDRICH (1820-95). A German composer, born at Ruhla, Thuringia. He studied with his father, with A. Michel at Gotha, and for two years with F. Schneider at Dessau, where he was musical director in the Court Theatre from 1841 until 1851, when he became kapellmeister at the Stadttheater, Mainz. Among his works are the operas *Das Käthchen von Heilbronn* (1846), *Die Fürstin von Athen*, *Der Schmied von Ruhla* (1885), and the symphony *Die vier Lebensalter*, besides church music and pianoforte pieces. His vocal music was of more than passing importance.

LUXEMBOURG, lụks'äɴ'bo͞or', FRANÇOIS HENRI DE MONTMORENCY-BOUTEVILLE, Duke of (1628-95). A Marshal of France. He was born in Paris, the posthumous son of François de Montmorency, Count of Bouteville, whom Louis XIII. caused to be beheaded for participating in a duel. He was brought up with the great

LUXEMBOURG PALACE



THE LUXEMBOURG PALACE AND GARDEN

Condé, with whom he fought at Rocroi (1643) and Lens (1648), and took part in the disturbances of the Fronde, going over with his leader to Spain. Received into favor by Louis XIV. after the Peace of the Pyrenees (1659), he served as a volunteer under Turenne in Flanders (1667), and as the lieutenant of Condé in Franche-Comté in 1668. He commanded in the Netherlands in 1672-73, and his masterly retreat in the latter year stamped him as one of the greatest generals of his day. In 1674 he fought under Condé at Seneffe. In the campaign of 1677 he defeated the Prince of Orange at Mont-Cassel (April 11th), and compelled the Prince to raise the siege of Charleroi. After the Peace of Nimeguen Louvois attempted to destroy him by implicating him in the famous poison trials. After a short term of imprisonment in the Bastille he was acquitted by the Chambre Ardente (q.v.). The King appointed him to the command of the army in Flanders ten years afterwards. On July 1, 1690, he gained a victory over the Prince of Waldeck at Fleurus, defeated William III. of England at Steenkerke (August 3, 1692), and at Neerwinden (July 29, 1693), and took Charleroi. He died January 4, 1695, at Versailles. He assumed the title Luxembourg on marrying the heiress of that house in 1661.

LUXEMBOURG PALACE. A palace situated in the Rue de Vaugirard, in the southern part of Paris, celebrated for its architecture, its gallery of modern French art, and its gardens. Its erection was begun in 1616 by Salomon de Brosse, for Maria de' Medici, and its rusticated masonry was intended to recall the architecture of the Pitti Palace in Florence, her former home. It was completed in 1620, but altered internally by Chalgrin near the end of the eighteenth century. Between 1835 and 1841 the main body of the palace was nearly doubled in size and provided with a new southern or garden façade reproducing the former one, while in the court inclosed between the old and new constructions a magnificent semicircular hall was built for the sessions of the House of Peers, and later of the Senate. These additions were the work of A. de Gisors. The Hall of the Senate was destroyed by fire in 1859, but was rebuilt on the same design. The name of the palace is derived from the Duke of Piney-Luxembourg, whose mansion once stood on the same site, but it has been officially known, under different governments, by the names of the governmental bodies which have successively occupied it; e.g. Palais du Directoire, du Consulat, du Sénat-conservateur, de la Chambre des Pairs, de la Préfecture, and du Sénat. It was occupied by the Senate from 1852 to 1870, and thence until 1879 by the Prefecture of the Seine and the municipal council. It has since 1879 been again occupied by the Senate. It has in addition served throughout nearly its whole history as a royal or public picture-gallery. An important series of twenty-four paintings by Rubens, illustrating the life of Maria de' Medici, once occupied the east gallery, but is now in the Louvre, and the splendid Museum of Modern Art, which formerly occupied this gallery and other apartments of the palace, is now housed in a neighboring and comparatively modern building, though still known as the Musée du Luxembourg. This is on the whole the most important collection of contemporary art in existence, and is devoted to both sculpture and painting. About ten years after an artist's death, his works are removed to the Louvre or to the provincial galleries. Most of the works are by French artists, but there is a special room devoted to other nationalities, the American being the best represented next to the French. The magnificent ceilings and mural decorations of the Senate Chamber, Salle d'attente, and other apartments of the palace constitute in themselves a notable collection of the works of Flandrin, Bouchot, Vauchelet, Pujol, and others, besides examples of the work of Rubens, Philippe de Champagne, Poussin, and other masters of the seventeenth century.

The building itself, with all its alterations, has preserved unchanged its original style and character. While recalling by its rusticated masonry the garden front of the Pitti Palace, it is thoroughly French in design. The main structure, originally H-formed in plan, fronts on a Court of Honor, which measures 300 by 360 feet, and is inclosed on the flanks and front by low wings or galleries. The entrance from the Rue de Vaugirard to this court is through a dome-capped portal serving as a clock-tower, an extremely successful design. Each of the four façades of the main palace, as enlarged in 1835-41, consists of a central pavilion with two corner pavilions, the whole being covered by a high roof of the type commonly known as a Mansard. The proportions of all parts of the building are happy, the composition and details dignified and harmonious, the internal decorations admirable and in places sumptuous. The apartments of Maria de' Medici were restored in 1817 and refurnished in the style of her time, and the elegant chapel adjoining them was restored in 1842. The gardens of the Luxembourg are of great extent and beauty. Originally laid out by De Brosse, they were nearly stripped in the Revolution, but restored in 1801, and although somewhat reduced in size by the cutting through of modern streets, they are still among the most noted gardens in France, and the only survival in Paris of a genuine Renaissance garden.

The *Petit Luxembourg* (formerly the Petit Bourbon), adjoining the above palace on the west, and occupied by the president of the Senate, was built by Richelieu in 1629, partly on the site of the old convent of the Filles du Calvaire. The elegant chapel by A. de Gisors (1842) stands on the site of the original chapel of the convent, some extant portions of which have been annexed to the Petit Luxembourg.

Consult: Favre, *Le Luxembourg, récits et confidences sur un vieux palais* (Paris, 1882); Bénédite, "Le musée du Luxembourg," in *Les musées de France* (1894 seq.).

LUXEMBURG, lŭks'em-bûrg, *Dutch pron.* -bɥrG. The largest province of Belgium, occupying the southeastern part of the country (Map: Belgium, D 5). Area, 1706 square miles. It belongs to the region of the Ardennes (q.v.), and has important iron deposits. The inhabitants are, however, mostly engaged in agriculture. The principal rivers are the Ourthe in the north and the Semois in the south. Population, in 1900, 222,154. Prior to 1839 the province formed a part of the Grand Duchy of Luxemburg. Capital, Arlon (q.v.).

LUXEMBURG. An independent grand duchy of Europe, bounded by the Prussian Rhine

Province on the north and east, German Lorraine and France on the south, and Belgium on the west (Map: Germany, B 4). Area, 998 square miles. The northern and more elevated part of the country belongs to the region of the Ardennes, and reaches an altitude of about 1800 feet. The southern part belongs to the plateau of Lorraine, is perceptibly lower, and is of remarkable fertility. The district lies in the basin of the Moselle (which forms a part of the eastern boundary), and is watered by the Sauer and its tributaries. The climate is somewhat rawer than that of Belgium and more changeable.

Agriculture is the chief industry. Over one-half of the total area consists of arable land. Cereals, the vine, and fruits are grown on a large scale. Stock-raising is also important. Luxemburg is noted for its iron deposits, found chiefly along the southwestern frontier. In 1901 there were 75 iron-mines, employing over 4700 persons, with an output of 4,500,000 tons, valued at over $2,270,000. Copper, antimony, and lead also exist, but are not exploited. The output of building-stone is considerable.

The chief manufacturing industries are connected with the mineral production. In 1901 the foundries and iron and steel mills of Luxemburg employed nearly 5000 persons, and the production of iron and steel for that year was valued at more than $18,700,000. Of less importance is the manufacture of woolens, gloves, pottery, paper, beer, and leather. For commercial purposes the grand duchy has formed a part of the German Zollverein since 1843. It exports chiefly minerals and manufactures, and imports coke, coal, and grain. The railway lines have a total length of 290 miles.

Luxemburg is a constitutional monarchy, hereditary in the male line, and administered under the Constitution promulgated in 1848 and revised in 1856 and 1868. The legislative power is vested in a House of Representatives of 45 members, elected for six years by restricted suffrage. The executive power is in the hands of a Minister of State, assisted by the directors of finance, justice, and interior—all nominated by the Grand Duke. There is also a nominated Council of State, whose functions are only advisory, and from which seven members are selected to form a court of administration. Luxemburg has been a neutral territory since 1867.

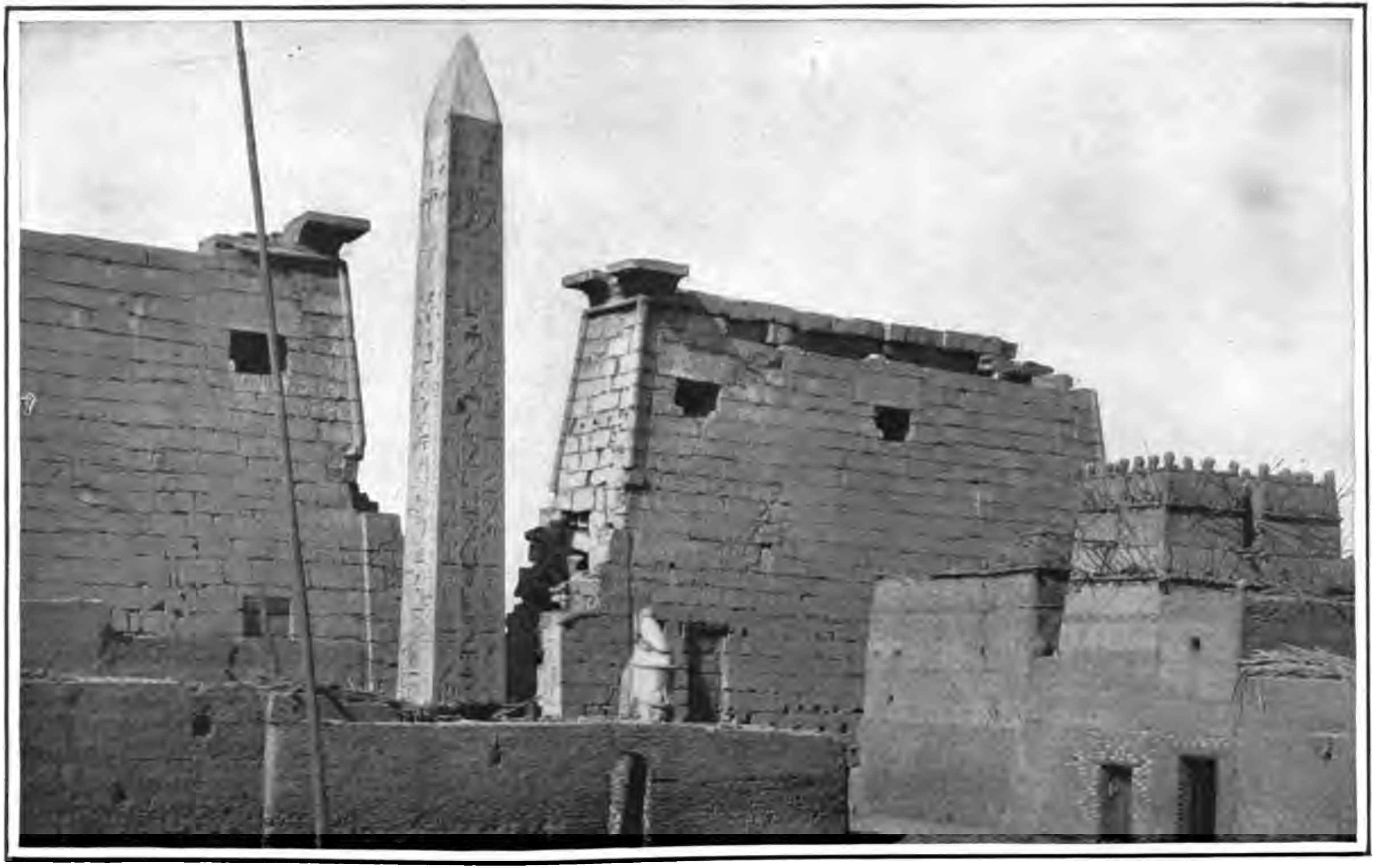
Military service is not obligatory. The armed force consists of less than 200 volunteers and of about 150 gendarmes. The revenue and expenditures for 1900 amounted to $1,891,400 and $2,277,400, respectively, the deficit having been met by the surplus of the preceding years. Luxemburg has a debt of about $2,400,000, contracted mainly for the construction of railways, and converted in 1893 into a single loan at 3½ per cent. The grand duchy has no separate currency, with the exception of fractional coins, based on the franc, which is the legal unit. Education is obligatory and well provided for. Luxemburg forms a separate bishopric. Population, in 1890, 211,088; in 1900, 236,543, almost exclusively Catholics. The inhabitants are of German origin and generally speak a German dialect, modified by an admixture of corrupt French. Capital, Luxemburg (q.v.).

History. The mediæval counts of Luxemburg took their name from the Castle of Lützelburg, around which the town of Luxemburg (originally called Lützelburg) grew up. The County of Luxemburg, which formed one of the petty principalities of the Holy Roman Empire of the Germans, first comes into prominence in 1308, in which year the German princes elected Count Henry to fill the Imperial throne. In 1310 his son, John the Blind, who had married the sister of Wenceslas III., of Bohemia, became King of that country. (See Bohemia.) John's son, Charles, King of Bohemia and German Emperor (Charles IV.), gave the country to his step-brother, Wenceslas, and raised it in 1353 to the rank of a duchy. In 1443 Luxemburg fell to Burgundy, and with the possessions of that house came into the hands of Spain, remaining, however, part of the German Empire. In the Peace of Utrecht in 1713, it was transferred to Austria. By the Peace of Campo-Formio (q.v.) it was ceded to France in 1797. It was elevated by the Congress of Vienna in 1815 to the rank of a grand duchy, and became a member of the German Confederation, but under the personal sovereignty of the King of the Netherlands as indemnity for the loss of Nassau. When Belgium became an independent kingdom (1831) Luxemburg was divided between it and Holland—the latter, however, retaining little more than the city of Luxemburg till 1839, when, by a treaty signed in London, another part of the territory was taken from Belgium and added to the city, forming the present Grand Duchy of Luxemburg, which remained subject to the King of the Netherlands. After the dissolution of the Germanic Confederation in 1866, the King of Holland wished to sell Luxemburg, which had been garrisoned since 1815 by Prussian troops, to France; but the summary action of Bismarck, who guided the policy of Prussia, prevented this barter, and in 1867 an international conference at London made Luxemburg a neutral sovereign State, under a guarantee of the Powers. In 1890 the death of William III. of Holland rendered the House of Orange extinct in the direct line of succession, and Luxemburg passed to the nearest collateral male line, represented by Adolphus, Duke of Nassau, who in December of that year assumed the title of Grand Duke of Luxemburg, thus ending the personal union that had previously made Luxemburg an appanage of the Netherlands.

Consult: Bonnardot, *Les archives de l'état de Luxembourg*, vol. xli. of the publication of the History Section of the Luxemburg Institute (1890); Coster, *Geschichte der Festung Luxemburg* (Luxemburg, 1869); also bibliography under Belgium; France; Germany; Netherlands.

LUXEMBURG. The capital of the Grand-Duchy of Luxemburg, picturesquely situated on the Alsette, 42 miles north of Metz by rail (Map: Belgium, E 5). The city consists of two parts, the Oberstadt, or upper town, crowning a rocky height, 200 feet above the Unterstädte, or lower town, which lies in the encircling ravine, the two parts communicating by flights of steps and winding streets. Lofty viaducts span the valley and connect the Oberstadt with the surrounding country. Public gardens occupy the site of the fortifications constructed under the direction of Vauban, after the plans of a Spanish engineer, which gained for Luxemburg the appellation of 'the Northern Gibraltar,' and which were dismantled in 1872. A few remains of these works include the Spanish towers and the tun-

LUXOR



PYLON AND OBELISK OF RAMESES II.

neled headland of Le Bouc, which commands an extensive view. The fine Gothic Cathedral of Notre Dame, the Palais du Roi, dating from 1580, restored, and now the grand ducal residence, the town hall with a choice collection of paintings, the barracks containing the museum of antiquities, and the home for the aged, are among the chief public buildings. The educational institutions include a theological seminary, athenæum, and public library. The industrial establishments, comprising cotton and linen mills, tanneries, breweries, dyeworks, etc., are situated in the Unterstädte. An active general trade is carried on. The city had its origin in the ancient Castle of Lützelburg, a name which was afterwards changed to Luxemburg. The place was a fortress of the Germanic Confederation (1815-66), and was garrisoned by Prussian troops, who retired in 1867 after the demolition of the fortifications and the neutrality of Luxemburg had been decided by the Treaty of London. Population, in 1895, 19,909; in 1900, 20,298.

LUX'OR. A village of Upper Egypt, on the east bank of the Nile, in about latitude 25° 50′ N., standing upon the site of ancient Thebes, a little to the southwest of Karnak (q.v.). Its Arabic name El-kusur (plural of el kasr), of which Luxor is a corruption, means the palaces, and has reference to the magnificent ruins upon which the village encroaches. The ruins are the remains of a great temple built by Amenophis III., on the site of an ancient sanctuary, and dedicated to the Theban triad Ammon, Mut, and Chons. It was not entirely finished at the death of Amenophis, and his son, the fanatical reformer, Amenophis IV. (q.v.), caused the name of Ammon and the reliefs representing the god to be obliterated throughout the building. Under Seti I. the reliefs were restored, and Rameses II. added a great colonnaded court, before whose massive pylon he erected six colossal statues of himself. Three of these statues are still in place. Before the main entrance stood two obelisks erected by Rameses II.; one of them is still in place, while the other now stands in the Place de la Concorde in Paris. The front of the pylon is covered with reliefs, representing scenes from the Asiatic wars of Rameses II., and below the reliefs is inscribed the poetic account of the battle of Kadesh on the Orontes, usually known as the Epic of Pentaur (q.v.). A gate between the towers of the pylon gave entrance to the great court of Rameses II., 187 feet long and 168 feet wide, with a colonnade (74 pillars) running along its four sides. In the northwestern corner are the remains of a chapel built by Thothmes III. This court was formerly completely covered up with rubbish, and houses were built over it; the western side has been cleared, but a mosque still stands over the eastern portion. The walls of the court are richly adorned with reliefs and inscriptions, and near the southern end are several colossal statues of Rameses II. From the court a colonnade of several pairs of columns, each 50 feet high, leads to a second court (148 feet long and 168 feet broad) built by Amenophis III. A colonnade, of which a large portion is well preserved, runs around three sides of it, while the upper end opens into a hypostyle hall, its roof supported by thirty-two columns. A door in the rear wall of the hypostyle hall leads into a smaller hall, which in Christian times was used as a church, the doorway leading to the inner rooms of the temple being walled up and converted into a niche. The hall is flanked by two chapels dedicated to the deities Mut and Chons, respectively, and to the rear is a vestibule upon which opens a sanctuary, built by Amenophis III., and rebuilt by Alexander the Great, designed for the reception of the sacred bark of Ammon. To the east of the vestibule and sanctuary are two small halls containing reliefs, representing the birth and accession to the throne of Amenophis III. To the rear is another hall, and into it opens another sanctuary in which was kept the sacred image of the god. Consult: *Description de l'Egypte* (Paris, 1809-29); Lepsius, *Denkmäler* (Berlin, 1849-58); Dümichen, *Geschichte des alten Aegyptens* (Berlin, 1878); Wilkinson, *Topography of Thebes* (London, 1835); Baedeker, *Aegypten* .(4th ed., Leipzig, 1897). See also THEBES.

LUYNES, lụ'ĕn', CHARLES D'ALBERT, Duke de (1578-1621). A French minister and favorite of Louis XIII. With Vitry, captain of the guard, he plotted against Concini, the favorite of the Queen mother, and in 1617, after Concini's assassination, received the latter's estates and Marquisate of Ancre, which was then named Albert. Luynes recalled the old ministers of Henry IV.; effected the Peace of Angoulême (1619); put down the Huguenot rebellion of 1621; and played a fairly clever part in diplomacy, although he sacrificed the interests of France at Ulm, and assisted the projects of Ferdinand II. (1620). In 1621 he died suddenly while campaigning against the Huguenots. See LOUIS XIII.

LUYNES, HONORÉ THÉODORIC PAUL JOSEPH D'ALBERT, Duke de (1802-67). A French archæologist. He was born in Paris, and studied language and archæology. He was elected to the Constituent Assembly in 1848, and to the Legislative Assembly in 1849. His works include *Etudes numismatiques* (1835) and *Essai sur la numismatique des Satrapies et de la Phénicie* (1846).

LUYS, lụ'ē', JULES BERNARD (1828-95). A French alienist, born in Paris, and educated there. In 1862 he became physician to the hospitals, and a year later physician to the Salpêtrière Hospital and the Ivry Asylum. He became a member of the Academy of Medicine in 1877. He wrote: *Des maladies héréditaires* (1863); *Recherches sur le système nerveux cérébro-spinal, sa structure, ses maladies* (1865), crowned by the Institute; *Iconographie photographique des centres nerveux* (1873); *Leçons sur la structure et les maladies du système nerveux* (1875); *Traité clinique et pratique des maladies mentales* (1881), which gained him the Lallemant prize; *Leçons cliniques sur les principaux phénomènes de l'hypnotisme* (1889); and *Traitement de la folie* (1894).

LUZÁN, lōō-thän', IGNACIO DE (1702-54). A Spanish author. He spent his youth in Italy, where he learned Greek and Latin, and made himself conversant with several modern languages. His verses in Spanish and his translation of Lachaussée's *Préjugé à la mode*, are inferior in importance to his *Poética* (1737), a work in which he proclaims the necessity of correcting the license then prevalent in Spanish literary production by subjecting it to strict classic rules. As a result of Luzán's endeavors there was soon established in Spain a school of writers who adopted the methods of French Classicism. Consult the edition of the *Poética* (Madrid, 1789); his poems in vol. i. of the *Poetas líricos del siglo XVIII.*, contained in the *Biblioteca de autores españoles;* Cueto, *Bosquejo históricoo-crítico de la poesía castellana en el siglo XVIII.*, prefixed to vol. lxi. of the *Biblioteca de autores españoles.*

LUZ-CABALLERO, lo͞os′ kä′bȧ-lyā′rô, José de la (1800-62). A Cuban educator, born in Havana. He received his education in Havana, and was made professor in the Seminary of San Carlos there in 1824. In 1832 he was appointed president of the College of Carraguao, and afterwards held the chair of philosophy in the College of San Francisco, Havana. He established the College of San Salvador at Havana, in 1848, and taught there until his death. He wrote: *Impugnación al examen de Cousin* (1840), and translations of Volney's *Travels in Egypt and Syria*, with notes and additions (1829), and of Siegling's *Public Prisons and Their Reforms* (1837). Consult the *Life*, by Rodriguez (New York, 1874).

LUZENBERG, lo͞o′zen-bẽrg, Charles Aloysius (1805-48). An American physician, born in Verona, Italy. He emigrated to the United States in 1819; attended lectures in the Jefferson Medical College in Philadelphia; in 1829 removed to New Orleans, where he was attached for a time to the Charity Hospital, and afterwards established the New Orleans Medical School, and performed many difficult surgical operations. He was in Europe in 1832-34, and was elected a corresponding member of the Paris Academy. He returned to Louisiana in 1834; founded the Society of Natural History in 1839, and the Louisiana Medico-Chirurgical Society in 1843, and was the first president of both. It is asserted that he was the first practitioner in the United States to prevent pitting in cases of smallpox, by the exclusion of light.

LUZERN, lo͞o-tsẽrn′. The German name for Lucerne (q.v.).

LUZERNE, lū-zẽrn′. A town, including a village of the same name, in Warren County, N. Y., 22 miles north of Saratoga Springs, on the east bank of the Hudson River, beautifully situated at the edge of the foothills of the Adirondack Mountains and on Lake Luzerne (Map: New York, G 2). It is connected by a bridge with Hadley Station on the Adirondack Railroad, a branch of the Delaware and Hudson, and is a well-known summer resort. Population, in 1890, 1679; in 1900, 1341.

LUZERNE, lụ′zârn′, Anne César de la (1741-91). A French diplomat. He was born in Paris, the brother of Cardinal Luzerne; entered the army at an early age, saw considerable active service, and for some time was an aide on the staff of Marshal Broglie, returning to civil life after reaching the rank of colonel of grenadiers. His diplomatic career began with his appointment in 1776 to the post of Envoy Extraordinary to Bavaria, where he conducted with great tact the negotiations connected with the succession of Maximilian Joseph to the electorate. His success on this mission led in 1779 to his being appointed to succeed Gérard (q.v.) as Minister to the United States. He arrived in Philadelphia in September. His method of treating with the Congress of the Federation was not that usually employed by diplomats. He understood from the start that body's lack of real power, and therefore dealt with the members individually, some of whom he is said to have had in his pay. He soon gained considerable influence, particularly with Robert R. Livingston, the Secretary for Foreign Affairs, and his intrigues while negotiations for peace were pending resulted in Congress sending instructions to its commissioners at Paris to be guided in their actions by the desires of the French Court. He returned to France in 1783, and from 1788 until his death represented France as Ambassador at London.

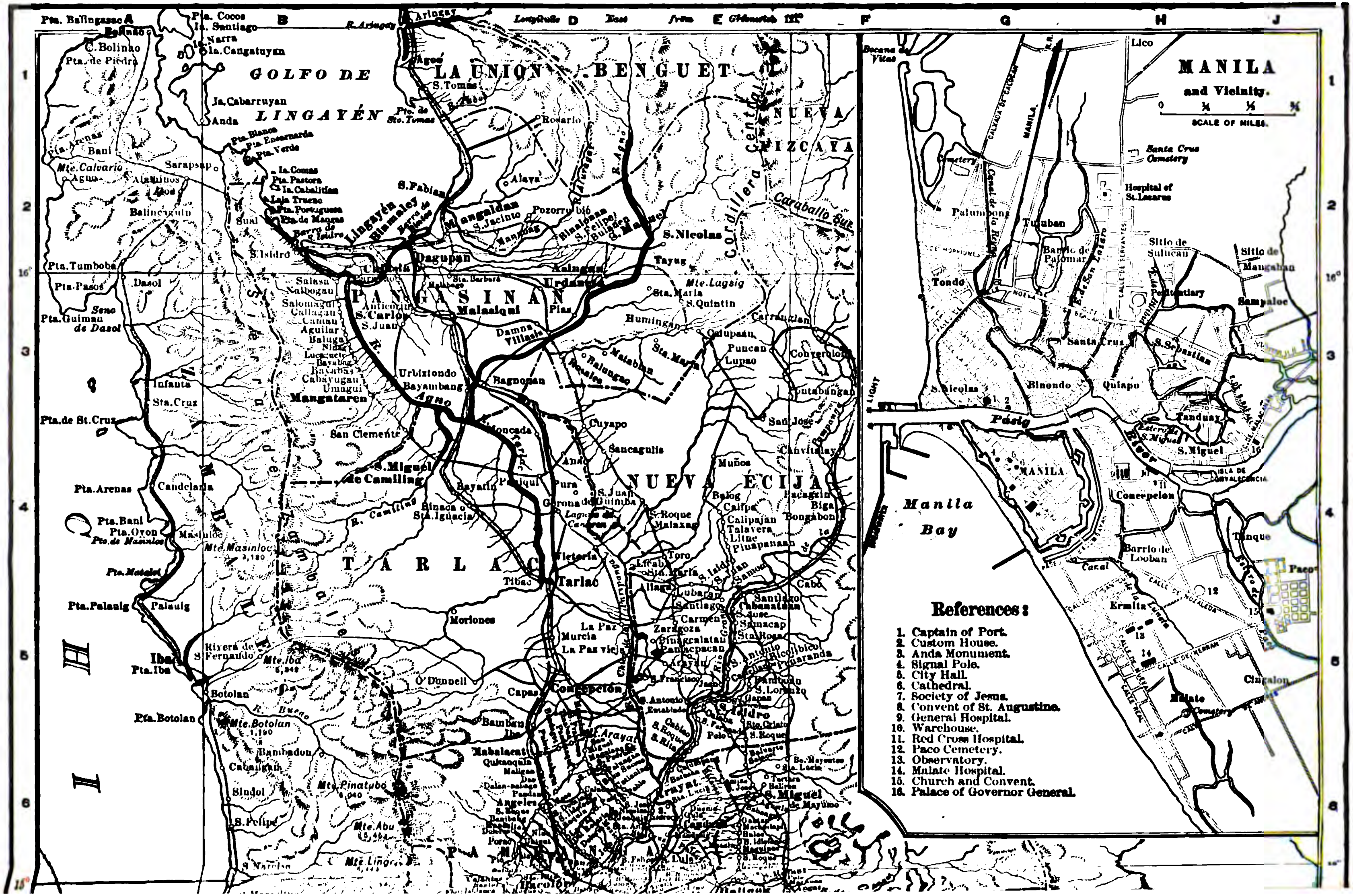
LUZON′, *Sp. pron.* lo͞o-thôn′. The most important, and with the exception of a few islets the most northern, of the Philippine Islands.

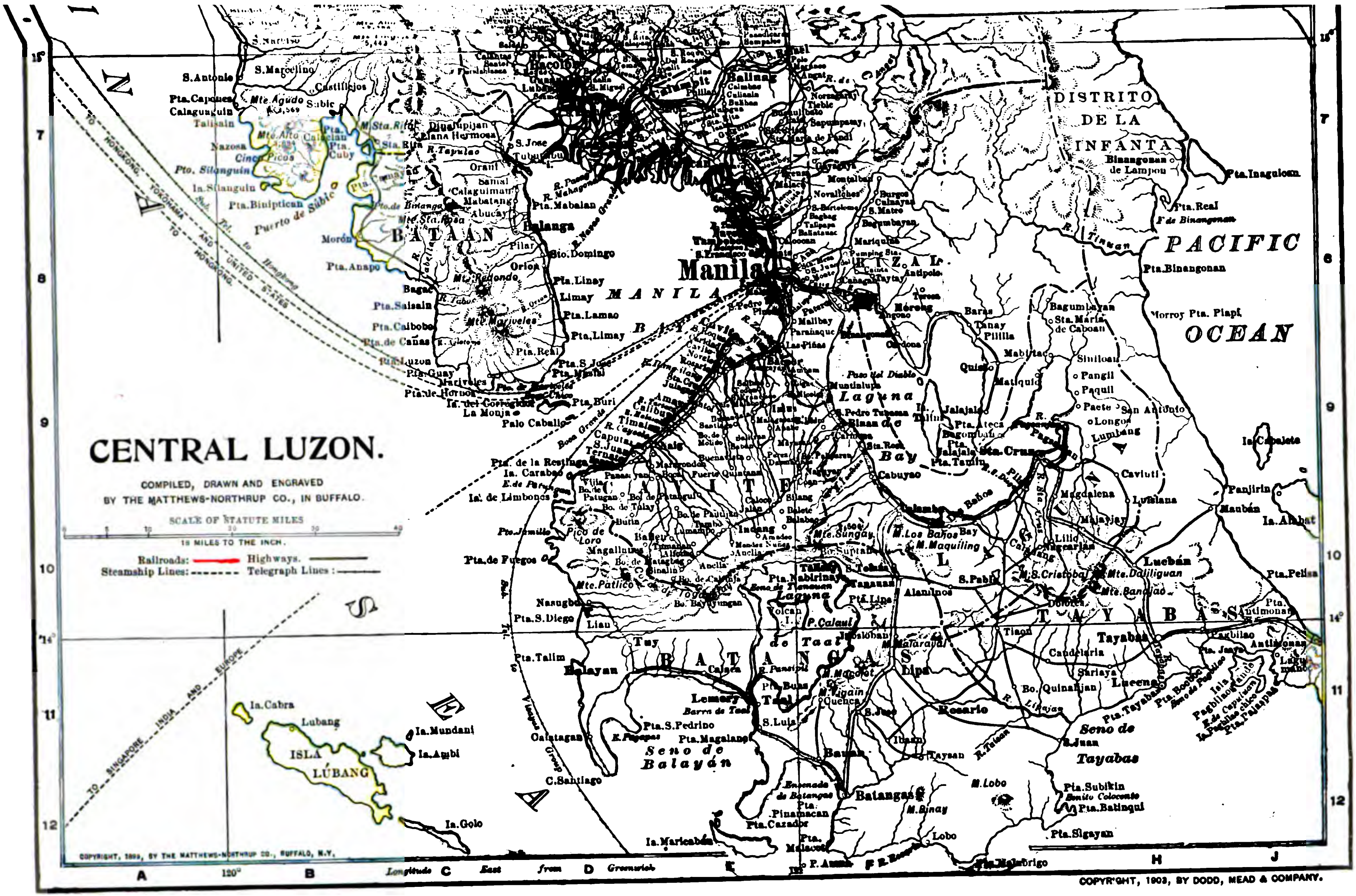
Location and Boundaries. Luzon is situated between latitudes 12° 32′ and 18° 39′ N., and between longitudes 119° 42′ and 124° 8′ E. Its northern extremity, Punta Mayraira, is 217 miles due south of Formosa, and 520 miles southeast of Hong Kong. The Pacific Ocean proper and the China Sea meet on its northern coast. The southern coast is washed by a number of channels and seas separating Luzon from the rest of the archipelago, the chief of these being the Strait of San Bernardino, 10½ miles wide, between Luzon and the island of Samar on the southeast, and the channel, 7½ miles wide, separating Mindoro from the southwest coast.

Area and Configuration. The area of Luzon has been variously estimated at from 37,000 to 47,000 square miles. The official estimate of 1902 is probably the most nearly correct, and gives 43,075 square miles for the mainland and 1160 for the 311 small dependent islands, giving a total of 44,235 square miles, which is nearly the total for the State of Pennsylvania. Its area is according to this estimate somewhat less than that of Mindanao (q.v.). The shape of the island is extremely irregular. It may be divided into three parts, connected by narrow isthmuses: Northern Luzon, the main body, with a length from north to south of 270 miles and a width of 130 to 140 miles; Central Luzon, 56 by 90 miles, connected with the first by two isthmuses, one on each side of the Laguna de Bay; and Southern Luzon, a long, narrow, and irregular body stretching 160 miles to the southeast. The coast is very much indented, with numerous large bays, some of which form excellent harbors. The chief bays are, on the west coast, the Gulf of Lingayén and Manila Bay; on the south coast, the bays of Tayabas and Ragay, and the port of Sorsogón; and on the east coast, the bays of Albay, Lagonoy, San Miguel, and Lamón.

The principal dependent islands belonging to Luzon are, with their areas in square miles, the Batanes (81) and the Babuyanes (179), two groups of small islands lying north of Luzon, the former being the extreme northern group of the archipelago; Polillo Island (203), near the centre of the eastern coast; Alabat (60), at the mouth of the Bay of Lamón; Catanduanes (704), off the southeast coast; and a number of smaller groups and islets, chiefly off the east coast.

Geology and Topography. Our knowledge of the geological structure of Luzon is meagre, owing to the natural difficulty arising from the dense vegetation, which leaves the rocks exposed in very few places. The geological formations, however, include the following: Gneiss and dia-


MANILA
and Vicinity.
0 ¼ ½ ¾
SCALE OF MILES.
References:
1. Captain of Port.
2. Custom House.
3. Anda Monument.
4. Signal Pole.
5. City Hall.
6. Cathedral.
7. Society of Jesus.
8. Convent of St. Augustine.
9. General Hospital.
10. Warehouse.
11. Red Cross Hospital.
12. Paco Cemetery.
13. Observatory.
14. Malate Hospital.
15. Church and Convent.
16. Palace of Governor General.
Manila Bay
Pasig River
Tondo
Binondo
Santa Cruz
Quiapo
S. Sebastian
Sampaloc
Ermita
Malate
Paco
Concepcion
Longitude D East from E Greenwich 121° F
GOLFO DE LINGAYÉN
LA UNION
BENGUET
NUEVA VIZCAYA
Cordillera Central
Caraballo Sur
PANGASINAN
TARLAC
NUEVA ÉCIJA
PAMPANGA
Zambales
Lingayén
Dagupan
S. Fabian
Tarlac
Concepcion
Capas
Iba
Botolan
CHINA



CENTRAL LUZON.

COMPILED, DRAWN AND ENGRAVED
BY THE MATTHEWS-NORTHRUP CO., IN BUFFALO.

SCALE OF STATUTE MILES

15 MILES TO THE INCH.

Railroads: ▬ Highways. ——
Steamship Lines: - - - - Telegraph Lines: —·—·—

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basic rocks, Eocene limestone, conglomerates, sandstones, recent formations containing marine fossils, banks of coral limestone, and recent volcanic rocks. Extensive inland beaches containing fossils of existing marine species indicate a recent upheaval, and Southern Luzon was probably at no very distant period a separate island.

The mountains of Luzon are included in three principal ranges, which unite in a common nucleus at Mount Caraballo Sur on the northern boundary of the Province of Nueva Ecija in North Luzon. The Sierra Madre range stretches in a continuous chain along the eastern coast, terminating in Cape Engaño, the extreme northeastern point of the island. The Central and North Cordilleras run in a more broken chain parallel with the western coast, and with the Sierra Madre inclose the large basin of the Rio Grande de Cagayán. The third great system runs southward along the eastern coast and occupies the whole of South Luzon, terminating in Point Sual at the extreme southeastern end. The principal detached chain is the Cordillera de Cabusilán, running along the western coast from Manila Bay to the Gulf of Lingayén, inclosing between it and the eastern chain the large central basin of the Agno and Pampanga rivers. The average height of these ranges is from 2000 to 4000 feet, Mount Datá of the Central Cordillera rising to a height of 7364 feet, the highest point in Luzon next to the isolated volcano Mayón, which reaches a height of 7566 feet.

There seem to be two distinct lines of volcanic activity in Luzon, the eastern line containing the active volcanoes of Bulsan, Bacón, and Mayón in the southeastern part, Cana at the northeastern extremity, and the extinct Isaróg north of Mayón; the western line contains the active volcano of Taál in West Central Luzon, and the extinct peaks of Aráyat and Súngay. Mayón is the most active, and has in the past century emitted considerable quantities of lava, but all of them seem now to be in the last stages of activity. Earthquakes are of frequent occurrence, and have on several occasions caused great losses of life and property, notably in 1863, when large parts of Manila were laid in ruins, and in 1880, when the whole island was convulsed with a series of severe shocks. The style of architecture has to be adapted to withstand these disturbances.

HYDROGRAPHY. Luzon, like all of the East India islands, is exceedingly well watered. The largest river system of the island, as well as of the whole archipelago, is that of the Rio Grande de Cagayán, running north from Caraballo Sur, which is the principal watershed for the three largest rivers of the island, the other two being the Pampanga, running south into Manila Bay, and the Agno, flowing west into the Gulf of Lingayén. The Abra and the Pagsán in the northwestern part are also considerable, and besides these there are numberless short streams running down from the Cordilleras on all sides. Luzon has two large and several smaller lakes. The largest is the Laguna de Bay, separating Central from North Luzon, and communicating with Manila Bay through the Pasig River. The other large lake is Taál, lying southwest of the former, and containing the island volcano of the same name. In the wet season several of the rivers expand into temporary lagoons, the plain of Candaba, east of the Pampanga River, being periodically a lake 24 miles in extent.

CLIMATE (for a general description, see PHILIPPINE ISLANDS). Owing to its higher latitude and to the fact that it is more exposed to the various winds, Luzon enjoys a climate somewhat cooler, less equable, though more agreeable, than that of the southern islands. The annual rainfall, though considerable (amounting at Manila to 75 and even 120 inches), is less than that of the other islands. Luzon lies directly in the path of the typhoons, known locally as *baguios*, which sometimes work considerable damage to property on shore as well as to shipping. Violent thunderstorms are also frequent.

FLORA AND FAUNA. These do not differ materially from those of the other islands, and are described in the article PHILIPPINE ISLANDS (q.v.). Vegetation is everywhere extremely luxuriant, and large areas are covered with valuable forests.

For history, see PHILIPPINE ISLANDS.

LU'ZULA (Neo-Lat., from OIt. *luzziola*, *lucciola*, glowworm, from *luce*, light, from Lat. *lux*, light; connected with Gk. *λεύσσειν*, *leussein*, to see, Skt. *ruc*, to shine, OChurch Slav. *lucha*, beam of light, OIr. *lŏche*, lightning, OHG. *lioht*, Ger. *Licht*, AS. *lēoht*, Eng. *light*). A genus of plants of the natural order Juncaceæ, having soft flat leaves, which are generally covered with thinly scattered longish hairs. They do not grow in wet places, like rushes, but in woods, pastures, and elevated mountainous situations. The English name, wood-rush, has sometimes been given to the whole genus, but is only appropriate to some, of which it is the popular name, as *Luzula maxima* and *Luzula campestris*, common American species.

LUZZATTI, lōō-tsä'tē, LUIGI (1841—). An Italian statesman and financier, born in Venice of a Jewish family. He taught for a time in the Instituto Tecnico in Milan, and in 1867 became professor of political economy and constitutional law at Padua. In 1871 he was elected to the House of Deputies, and soon became prominent in matters of finance. He was Minister of the Treasury in Rudini's Cabinet in 1891-92 and 1896-98. An active philanthropist, Luzzatti founded many savings banks and mutual relief associations.

LUZZATTO, lōō-tsä'tō, SAMUEL DAVID (1800-65). A Hebrew scholar and writer on Jewish history. He was born in Triest, received an academic education, and was professor of biblical exegesis in the Rabbinical School at Padua from its foundation in 1829 till his death. He was regarded as one of the chief restorers of Hebrew literature. His published works include: a *Hebrew Grammar;* an *Aramaic Version of Onkelos* (1830); *Notes on Isaiah* (1834); *Dialogues on the Cabala, the Zohar, and the Antiquity of the Vowel Points and Accents of the Bible* (1852); and *Hebrew Notes on the Pentateuch, with a Hebrew Commentary* (1850). His writings on Jewish history are also of great merit.

LUZZI, lōō'tsē, PIETRO. See MORTO DA FELTRE.

LVOFF, l'vŏf, ALEXEI FEODOROVITCH (1798-1870). A Russian musician, and composer of the national hymn. He was born at Reval, where his father was a well-known musician. He was educated for the army, and after graduating from the military technical (communciation) institute he received a commission in the Imperial Guards. Meanwhile, he had educated himself thoroughly in music, and had become distinguished for his musical attainments. In 1836 he was appointed conductor of the Imperial Court Choir, succeeding his father, a position which he held until 1855. His instrument was the violin, on which he was an excellent performer; besides which he was a student of Old Russian Church song, and of Russian folk-music. In 1859 he published an essay *On the Free and Non-symmetrical Rhythm of Old Russian Church Song*. His compositions include four operas, the only successful one of which was *Undine* (1846); Church music; part songs; arrangements of Russian folk-songs; and a considerable number of pieces for the violin. He was commissioned by the Czar to compose the music to the words of the national hymn, which had been written by Zhukovski (1833). He died on his family estate in the Government of Kovno.

LYALL, lī'al, Sir Alfred Comyn (1835—). An English administrator and author, born at Coulston, Surrey. He studied at Eton, entered the Bengal Civil Service as assistant magistrate and collector in the Northwest Provinces of India, in 1878 was appointed secretary to the Government of India, foreign department, and from 1882 to 1887 was Lieutenant-Governor of the Northwest Provinces. In 1888 he was appointed a member of the council of the Secretary of State for India. His publications include: *Asiatic Studies* (1882-99); a discriminating *Life of Warren Hastings* (1889; in the "English Men of Action Series"); *Rise of the British Dominion in India* (1893; 3d ed. in that year); and the volume on *Alfred Tennyson* in the "English Men of Letters Series" (1902).

LYALL, Sir Charles James (1845—). An English Orientalist, educated at King's College School, King's College, and Balliol College, Oxford. He was Under-Secretary to the Government of the Northwest Provinces (1871-72); served in the Foreign Department (1872); was judge and commissioner of the Assam valley districts (1888-89), secretary in the Home Department of the Indian Government (1889-94), and Chief Commissioner of Assam (1894), and of the Central Provinces (1895-98). He wrote *Translations of Ancient Arabic Poetry* (1885) and *Ten Ancient Arabic Poems* (1894).

LYALL, Edna (?-1903). The pen-name of Ada Ellen Bayly, an English author. She was born at Brighton, and in 1879 published her first novel, *Won by Waiting*. This was followed by a series of quiet, purposeful works of fiction, including: *Donovan* (1882); *We Two* (1884); *In the Golden Days* (1885); *Knight Errant* (1887); *The Autobiography of a Slander* (1887); *Derrick Vaughn* (1889); *A Hardy Norseman* (1889); *To Right the Wrong* (1892); *Doreen* (1894); *The Autobiography of a Truth* (1896); *Wayfaring Men* (1897); *Hope the Hermit* (1898); *In Spite of All* (1901); and *The Hinderers*.

LYCABETTUS, lĭk'ȧ-bĕt'tụs (Lat., from Gk. Λυκαβηττός, *Lykabēttos*). The modern mountain of Saint George, a conical hill of bluish-gray limestone, northeast of Athens, in which the range of hills by which the Athenian plain is divided terminates. Its summit, 910 feet above the sea, is crowned by a chapel of Saint George, from which commanding views are obtained of the city and surrounding country. Most of the modern houses of Athens are built of the stone quarried from the hill, from which much of the material for the ancient structures was also obtained. On the southwest portion of the hill was a cistern in which the aqueduct built by Hadrian and Antoninus ended. The aqueduct was repaired between 1855 and 1869, and now furnishes the water-supply of the city.

LY'CANTHRO'PIA. See Werwolf.

LYCA'ON (Lat., from Gk. Λυκάων, *Lykaōn*). A legendary king of Arcadia, son of Pelasgus and Melibœa, or Cyllene. He had many sons, some say fifty, others only twenty-two, whose names are obviously merely the eponyms of founders of Peloponnesian cities. According to the tradition of the Arcadians, he first introduced the worship of Zeus Lycæus, founding Lycosura near the top of Mount Lycæus. He, however, in his savage ignorance offered human sacrifices, and therefore at the very altar was turned into a wolf. Another version dwells on the crimes of Lycaon and his sons, which finally brought Zeus from Olympus to investigate the reports. To him a child was offered and the flesh set before the god, who in anger slew all the family with the thunderbolt, save one son, or transformed Lycaon into a wolf, and slew the sons. The transformation story is evidently due to etymologizing, but it seems probable that human sacrifices were long offered to Zeus Lycæus on the top of the mountain. The exact relation of Lycaon to this cult is not clear, but it is by no means improbable that he was originally a god, perhaps a wolf-god worshiped with savage rites, perhaps a light-god, who was displaced, like so many other lesser gods, by the greater god, and thus sank to a hero of legend.

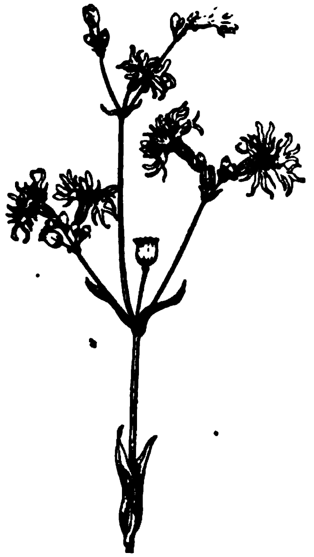
LYCAON. See Hunting-Dog.

LYCAONIA, lĭk'ȧ-ō'nĭ-ȧ (Lat., from Gk. Λυκαονία, *Lykaonia*). In ancient geography, a country forming part of the tableland of Asia Minor. It was bounded on the east by Cappadocia, on the north by Galatia, on the west by Pisidia and Phrygia, and on the south by Cilicia. Its capital was Iconium (see Konieh), and Derbe and Lystra were among its cities.

Having formed a part of the domains of the kings of Cappadocia, it was, in A.D. 41, incorporated in the Roman Province of Galatia. It was made a separate province in the early fourth century. Later it fell under the Seljuk rulers. See Derbe; Galatia; Konieh; Lystra.

LYCE'UM (Lat., from Gk. Λύκειον, *Lykeion*, neut. of Λύκειος, *Lykeios*, epithet of Apollo; connected with λευκός, *leukos*, white, bright, Lat. *lux*, light, Skt. *ruc*, to shine; popularly connected either with λύκος, *lykos*, wolf, as being supposed to be a slayer of wolves, or with Λυκία, *Lykia*, as being regarded as a Lycian divinity). The largest of the gymnasia of ancient Athens, which received its name from the temple of Apollo Lycius, that stood near by. The Lyceum was situated in the eastern suburb of the city, south of the Cynosarges, and not far from the city wall. Socrates used to frequent the spot, and here, in the groves and walks that belonged to the place, Aristotle at a later period gave instruction in philosophy. Hence the more recent meanings of the word have been derived: a school where philosophy is cultivated, an intermediate classical school (France), and a building used for lectures and the like.

LYCHNIS, lĭk′nĭs (Lat., rose of a bright-red color, from Gk. λυχνίς, a plant with a scarlet flower; connected with λύχνος, *lychnos*, lamp). A genus of mostly perennial herbs of the natural order Caryophyllaceæ; natives of temperate climates. The ragged robin (*Lychnis Flos-cuculi*) is one of the most frequent ornaments of meadows and moist pastures in Europe, but is rare in America; the German catchfly (*Lychnis Viscaria*) is very rare, and generally found growing on almost inaccessible precipices; the red campion (*Lychnis dioica*) and the white campion (*Lychnis divaricata*) abound in fields, hedges, and the borders of woods. The flowers of *Lychnis vespertina* are usually fragrant in the evening. The scarlet lychnis (*Lychnis chalcedonica*), a native of Asia Minor, is a frequent and brilliant ornament of flower-borders. *Lychnis Githago*, the corn-cockle, is a common weed in wheat-fields in the United States, its purplish-red petals making it very conspicuous. It sometimes is so abundant that it depreciates the value of the crop through the presence of its seeds in the grain. Some of the species have saponaceous properties.



LYCHNIS.

LYCIA, lĭsh′ĭ-ȧ (Lat., from Gk. Λυκία, *Lykia*). A country on the southwestern coast of Asia Minor, bounded on the northwest by Caria, on the north by Phrygia, on the northeast by Pisidia, and on the east by Pamphylia. The ancient inhabitants are said to have been two races called the *Solymi* and *Tramilæ* or *Termilæ*, the former of whom seem to have been driven from the coast to the mountain plateau of Milyas in the north by the latter, who seem to have been of the Indo-European race, and to have entered the country by sea. They early developed a city life and stood in close connection with the Greeks. It is doubtful whether the Lycians can be identified with the *Leka* of the Egyptian inscriptions. Though the Lycians seem to have maintained their independence against the Lydians, they were subdued by the Persians under Harpagus, the general of Cyrus, after an heroic resistance during which the inhabitants of the chief city, Xanthus, burned their citadel, with their wives, children, and property, rather than surrender. The Persians attached the country to the Carian satrapy, but seem to have left the old forms of government undisturbed. The Lycians seem to have formed a league of cities governed by a body of nobles, with a chief in every city whose name appears on the coins. The chief cities were: Xanthus; Patara, with a temple of Apollo; Pinara, and Tlos in the west, on the hills along the valley of the Xanthus; Telmessus, the seat of an oracle, further to the northwest, while to the south and east, near the coast, were Myra, Limyra, and Olympus. Persian influence was strong in the ruling families, but the civilization and especially the art were strongly Hellenic. Even in the sixth century B.C. the Harpy tomb of Xanthus shows the work of Greek artists, the reliefs of Gölbashi (Trysa) are a reflection of the paintings of Polygnotus, and the Nereid monument reproduces the Greek art of the fourth century B.C. After the Persian wars the Lycian cities were for a time enrolled in the Delian League, but seem to have returned to Persian rule before B.C. 440. Early in the fourth century they for a time attempted to assert their independence, but were again reduced. With the rest of Asia, Minor Lycia was subdued by Alexander, and later came under the rule of the kings of Syria. The Romans first gave it to the Rhodians, but later recognized its independence, and the Lycian league of twenty-three cities, with a *Lyciarch* as its chief officer, continued to exist, with some vicissitudes, until Vespasian finally united the district to Pamphylia. The mountainous region abounds in interesting ruins of the past. The antiquities, however, had received little attention till Sir Charles Fellows (q.v.), about the year 1838, pointed out their interesting character. Since that time they have been more carefully explored and studied. Among the monuments a prominent place is held by the inscriptions in the native language. (See LYCIAN LANGUAGE.) Lycia has no importance in early Christian history.

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LYCIAN LANGUAGE. The native language of the ancient Lycians is only imperfectly known. In 1838 and 1840 Fellows discovered and copied thirty inscriptions in Lycia. Among these, one found at Xanthus covered the four sides of a large obelisk having, in addition to 238 lines of Lycian, a Greek epigram of 12 hexameters. The others were all tomb inscriptions, one of them, found at Limyra, being a bilingual, Greek and Lycian. Another bilingual found at Antiphellus was published by Grotefend in 1842. The same year

Daniell and Spratt and Forbes copied 36 Lycian inscriptions, among them two bilinguals from Lamisii and Tlos. Schönborn in 1841-42 and again in 1851 gathered a rich collection, published after his death by Schmidt. A number of Lycian coins were found and published by Fellows in 1855. The bilingual decree of Pixodarus, Carian ruler (B.C. 340-335), was published by Schmidt in 1869. Most of the inscriptions have been found at Limyra; others come from Xanthus, Antiphellus, Myra, Telmessus, Cadyanda, Cyanæ, Pinara, Rhodiopolis, Sura, and Candyba. They are written in an alphabet which has borrowed the Greek letters and adopted new signs for a number of sounds. The forms of the Greek letters show a greater resemblance to the Doric than to the Ionian. If this speaks for a higher age, the presence of χ and ϕ, unless it is a later acquisition, would indicate a comparatively late origin of the Lycian alphabet. Strong reasons have been adduced by Sharpe, Lassen, Savelsberg, and Lagarde for the opinion that the Lycian is an Iranian language, akin to the Avestan and the old Persian and also to the Armenian. P seems to have changed into *h*, as in Armenian, and as *f* into *h* in the Kurdish (q.v.); on the other hand, *s* is not changed into *h* in the Lycian. The time of the inscriptions can be approximately fixed by their general similarity and by the known date of Pixodarus. Whether Savelsberg is correct in identifying Darius II. and Artaxerxes III. on the Xanthus monument cannot yet be determined with certainty. But his theory that the obelisk celebrates a great effort to throw off the Persian yoke in the generation preceding Alexander, though somewhat bold, is at least plausible. Consult the works mentioned in the article LYCIA, and Grotefend, in *Zeitschrift für die Kunde des Morgenlandes*, vol. v.; Texier, *Description de l'Asie Mineure faite par ordre du gouvernement français de 1833-37*, vol. iii. (Paris, 1849); Lassen, in *Zeitschrift der deutschen morgenländischen Gesellschaft*, vol. x.; Moriz Schmidt, *The Lycian Inscriptions* (London, 1869); *Neue lykische Inschriften* (Jena, 1869); Savelsberg, *Beiträge zur Entzifferung lykischen Sprachdenkmäler*, i. and ii. (Bonn, 1874-78).

LYCIDAS, lĭs'ĭ-dȧs. (1) A shepherd mentioned in the Seventh Eclogue of Vergil. (2) A poem by Milton (1638), in commemoration of the death of Edward King, the poet's friend, who was drowned in 1637.

LYCIUM, lĭs'ĭ-ŭm. A genus of about 70 species of erect or twining, often spiny, shrubs of the natural order Solanaceæ, found in warm and temperate climates and much cultivated for ornament. They bear small, entire, alternate leaves and axillary or terminal, diversely colored, solitary flowers, followed by oval orange-red berries. *Lycium vulgare*, popularly known as matrimony vine, and, like other members of the genus, boxthorn, has been introduced from the Mediterranean region and has escaped from gardens in the United States. *Lycium Carolinianum* is a common native species in the salt marshes from South Carolina to Florida.

LYCK, lĭk. A town in the Province of East Prussia, Germany, near the Russian frontier, 100 miles southeast of Königsberg (Map: Germany, K 2). It has an old castle built on an island by the Teutonic Knights, and once used as a prison. Its industries include the manufacture of machinery, leather, mineral waters, and furniture. Population, in 1900, 11,419.

LYCOMEDES, lĭk'ō-mē'dēz. A king of the island of Scyros, son of Apollo and Parthenope, father of Deidameia, and grandfather of Neoptolimus. To his care Thetis intrusted Achilles, disguised in feminine garments, in order to prevent him from taking part in the Trojan War. When Theseus, driven from the throne of Athens, sought his protection, Lycomedes treacherously caused his death by throwing him down a precipice.

LY'CON (Lat., from Gk. Λύκων, *Lykōn*) (c.300-226 B.C.). A Greek Peripatetic philosopher, born in the Troad. He was one of the successors of Aristotle and Theophrastus as the head of the Peripatetic School, B.C. 270-226. So distinguished was he for his charm of person and mind, and for his eloquence, that his followers prefixed the letter gamma to his name, making it Γλύκων, that is, 'The Sweet.'

LY'COPHRON (Lat., from Gk. Λυκόφρων, *Lykophrōn*) (flourished third century B.C.). A Greek poet and grammarian. Born at Chalcis, Lycophron lived in later life at Alexandria, where, under Ptolemy Philadelphus (B.C. 283-247), he was distinguished as one of the Pleiad, or band of seven tragic poets. He was intrusted with the arrangement of that part of the Alexandrian library which had to do with comedy. Suidas gives the titles of twenty of his tragedies; according to Tzetzes, he wrote forty-six or fifty-six pieces. The fragments of these are published by Nauck (*Trag. Græc. Frag.*, 2d ed., Leipzig, 1889). Only his *Cassandra* or *Alexandra* (Κασσάνδρα or Ἀλεξάνδρα), an iambic poem of 1474 verses, is preserved. The story is simple—in an oracular and obscure style, Cassandra prophesies the downfall of Troy and the subsequent adventures of the Trojan and Argive heroes. Especial attention is paid to the founding of cities. Two passages even foretell the settlement of Æneas in Latium, but these are probably later interpolations. The best edition is that of Holzinger, with a German translation and a commentary (Leipzig, 1895). There is an English translation by Yorke (Cambridge, 1806).

LY'COPODIA'LES (Neo-Lat. nom. pl., from λύκος, *lykos*, wolf + ποῦς, *pous*, foot; so called from the appearance of the roots). One of the three great divisions of fern-plants (pteridophytes), and usually regarded as the one of highest rank. Popularly they are called 'club-mosses,' and the majority of them belong to two genera, Lycopodium and Selaginella. They differ strikingly in habit from the other pteridophytes, in that the aërial body consists of slender branching stems thickly clothed with very numerous small leaves. Many of the more delicate species of Selaginella resemble coarse mosses, and are common in greenhouses as decorative plants. In the Carboniferous period (coal measures) the club-mosses included tree forms, some of which were very bulky and formed a conspicuous part of the forest vegetation. Only the smaller forms have survived, about five hundred species being represented in the flora of to-day. In temperate and colder regions the coarser Lycopodiums prevail, often called 'ground-pines' as well as 'club-mosses'; while in the tropics the more delicate and more numerous Selaginellas are chiefly displayed. Aside from the moss-like habit, the most conspicuous feature of the group is the 'strobilus.'

The word literally means 'cone,' and refers to a terminal, conical or cylindrical, spore-bearing structure. It is the presence of these club-like bodies at the ends of the moss-like branches which has suggested the name 'club-mosses.' The strobilus is composed of a series of closely overlapping bracts (reduced leaves), each one of which bears at its base upon the upper side a single spore-case (sporangium), in which the spores are produced. This strobilus is the same structure as that called a 'cone' in the pines and their allies.

A very important fact in connection with the club-mosses is that the species of Selaginella are heterosporous. When a microspore germinates it produces a very small male plant (male gametophyte), so small that it does not escape from the spore. This small and concealed male plant develops a sex-organ (antheridium) which produces sperms. The sperms of club-mosses differ from those of other pteridophytes in that they are very small and have only two cilia for locomotion. When a megaspore germinates it produces a small female plant (female gametophyte), which remains within the megaspore, but ruptures it on one side, growing out a little beyond it. In this exposed part of the little female plant sex-organs (archegonia) are developed, in each of which an egg is formed. To these eggs the sperms have access and fertilize them. The resulting fertilized egg (oöspore) then germinates and produces the ordinary leafy club-moss, which is a sexless plant (sporophyte). The habit of some species of Selaginella which do not shed the megaspore is so suggestive of seed-plants that many think the seed-plants, or at least some of them, may have been derived from the club-mosses.

The quillworts (species of Isoëtes) should probably be associated with the club-mosses in the group Lycopodiales, though some would include them with the true ferns (Filicales). They look like very slender tufted grasses growing in water, the habit being very unlike that of the club-mosses. In many important particulars, however, the resemblance is striking, the most conspicuous being the single spore-case (sporangium) at the base of each spore-bearing leaf. Quillworts are also heterosporous, as are the species of Selaginella. The most important difference is in the sperm, which is large and bears many cilia, as in the ordinary ferns.

Recently it has been thought that perhaps the adder-tongues (Ophioglossum) and moonworts (Botrychium) should be placed among the Lycopodiales rather than with the true ferns, with which they have always been associated, although as a very distinct group.

The genus Lycopodium has fossil representatives, called Lycopodites, in the Devonian, Carboniferous, and Jurassic rocks. Allied forms are Psilotum and Psilophyton, the latter of which is very abundant in the form of graceful leafy terminal branches in the Devonian shales and sandstones of North America and the Rhine provinces of Germany. Other fossils, usually considered to be gigantic ancestral club-mosses, are the lepidodendrids of late Paleozoic time. See the articles LEPIDODENDRON; PTERIDOPHYTES; ALTERNATION OF GENERATIONS; OÖSPORE; SPERMATOPHYTE.

LY'COPO'DIUM. A genus of club-mosses. See LYCOPODIALES.

LYCOP'OLIS. A city of ancient Egypt. See SIUT.

LYCUR'GUS (Lat., from Gk. *Λυκοῦργος*, *Lykourgos*). According to common tradition, a Spartan lawgiver and political reformer, who lived in the ninth century B.C., and was a son of King Eunomus. The legend tells how he exiled himself from Sparta in order to avoid the suspicion of aiming at the throne of his infant nephew, Charilaus; traveled in Greece, Asia, and Egypt, and studied the laws of Minos in Crete. Returning home, he found Sparta in civil commotion and at war with her neighbors. He undertook to introduce a new constitution and to establish a new social order, which should make of Sparta a preëminently military State. How much of what is traditionally attributed to Lycurgus was actually his work it is not easy to define with accuracy. See SPARTA.

LYCURGUS (c.395-323 B.C.). A Greek orator, included in the canon of the ten Attic orators by the Alexandrian critics. He was born at Athens, and spent his life there. He is most famous for his management of the finances of Athens after the defeat of Chæronea; in fact, he was the only statesman of antiquity who displayed real knowedge of finance. For twelve years (338-326) he controlled the revenues, and under his administration many new buildings were built and many old buildings were remodeled or completed. These included the arsenal of Philo, the Panhellenic Stadion, the Lyceum, and the theatre of Dionysus. In politics Lycurgus favored the anti-Macedonian policy of Demosthenes (q.v.), and he was one of the orators whose surrender Alexander demanded after the destruction of Thebes (335), although this demand was afterwards withdrawn. Fifteen years after his death, when the democratic party came into power, a decree was passed by the Athenians that public honors should be paid him; a bronze statue of him was set up in the Ceramicus. The ancients possessed fifteen speeches of Lycurgus, two of which were written in defense of his financial policy. Only one has been preserved, the speech *Against Leocrates*. The speech, together with the fragments of Lycurgus, has been published by Blass (Leipzig, 1899). Consult also: Blass, *Die attische Beredsamkeit* (2d ed., Leipzig, 1887-98); Jebb, *The Attio Orators* (London, 1876).

LYD'DA (Lat., from Gk. *Λύδδα*, Heb. *Lōd*, renamed *Diospolis* in the second century A.D.). A city of Palestine, in the plain of Sharon, about 10 miles southeast of Joppa. According to I. Chron. viii. 12, it was founded by Shamer or Shamed of the tribe of Benjamin, the historical foundation for which is probably that a Benjamite clan was settled there. Some of its inhabitants must have been taken to Babylonia, for Lodites appear in the lists of those who returned under Zerubbabel, Ezra, and Nehemiah (Ezra ii. 33; Neh. vii. 37; xi. 35). It was the place where Saint Peter healed Æneas and received the request to proceed to Joppa on behalf of Dorcas (Acts ix. 32-43). Lydda is mentioned by Josephus (*Wars*, iii. 3, 5) as one of the eleven toparchies or districts over which Jerusalem presided. Its inhabitants suffered considerably during the various struggles of the Jews against Roman supremacy. About the time of Vespasian, Lydda was a home of Jewish learning, and became the seat of a bishopric early in Christian times. Outside of its biblical associations, the town is famous for its connection with Saint George, who is said to have been born and buried there. A church was built over his tomb, which has been repeatedly destroyed and rebuilt. It is now in possession of the Greeks, by whom it has been restored. Lydda was situated on the road from Joppa to Jerusalem, and it is now a station on the railroad. In ancient times it was also on the great caravan route between Babylon and Egypt. The modern village on the ancient site still preserves the ancient name Ludd.

LYDDITE. A high explosive, receiving its name from Lydd in Kent, the place of its first manufacture. It is used as a bursting charge for shells, its reputed destructive power being due to the shock of air-concussion, rather than to the fragments produced by the rupture of the shell. It is supposed to kill by shock, or suffocate by its fumes, every living thing within a radius of twenty-five yards of the bursting-point. It is a very stable compound under changes of temperature, and is said to be fully as effective against masonry as black powder, and twice as effective against sand or earth. It was extensively used against the Boers in the war of 1899-1902, but, owing to the character and conformation of the positions usually selected by the Boers, it did not prove very destructive. Its real value is still problematic. See EXPLOSIVES.

LY'DEKKER, RICHARD (1849—). An English naturalist. He was educated at Trinity College, Cambridge, in 1874 was appointed to the staff of the Geological Survey of India, and during his Indian residence made particular study of the series of vertebrate fossils from the Siwalik Hills. In 1884 he undertook for the British Museum the preparation of catalogues of the fossil mammalia, amphibia, reptilia, and birds in that institution. He also visited the Argentine Republic in' 1893 and 1894, to study the fossil mammals contained in the Plata Museum. Elected a fellow of the Zoölogical Society in 1880, and in 1898 a member of its council, he also became a fellow of the Geological Society in 1883, a member of the council of the organization in 1886 and 1893, and a vice-president in 1894. He wrote numerous works, including: *Catalogue of the Remains of Siwalik Vertebrata Contained in the Geological Department of the Indian Museum* (1885); *Catalogue of the Remains of Pleistocene and Prehistoric Vertebrata in the Geological Department of the Indian Museum, Calcutta* (1886); *An Introduction to the Study of Mammals, Living and Extinct* (1891); *The Royal Natural History* (1893-96); *A Geographical History of Mammals* (1896); *The Deer of All Lands: A History of the Family Cervidæ, Living and Extinct* (1898); and *Wild Oxen, Sheep, and Goats of All Lands, Living and Extinct* (1898).

LYDGATE, lĭd'gāt, JOHN (c.1370-c.1451). An English poet. He was educated at Oxford, traveled considerably in France, entered the Benedictine Order, and conducted a school of rhetoric and philosophy at the monastery of Bury Saint Edmunds. An admirer and imitator of Chaucer, he wrote in ten-syllabled couplets an additional Canterbury Tale, called *The Storie of Thebes* and represented as having been narrated by the author after joining the pilgrims on their return. His other works include *The Troy Book* (1420) and *The Falls of Princes* (1430), both based on Middle-Age Latin originals. His work, largely bungling in versification and prosy in detail, has eminent historic value, not only as the chief literary monument of the obscure post-Chaucerian period, but as the repository of information on contemporary manners. A selection from the lesser poems was made by Halliwell-Phillipps in 1840.

LYD'IA (Lat., from Gk. *Λυδία*). An ancient country of Asia Minor, bounded on the west by Ionia, on the south by Caria, on the east by Phrygia, and on the north by Mysia. The earliest Greek name for the country is said to have been Mæonia. The inhabitants are said to have been closely akin to the Phrygians and Mysians, and in that case were probably Indo-Europeans, though the names of the kings suggest Semitic origin. The country was mountainous in the south and west, the principal range being that of Tmolus. It was celebrated for its fruitful soil and for its mineral wealth, particularly for the gold of the river Pactolus and of the neighboring mines. The people were active traders, and early developed considerable wealth and luxury. Coined money seems to be their invention, and in religion and music they strongly influenced the Greeks, from whom in turn they received their alphabet, and of whose customs and gods, and especially of the oracle at Delphi, their kings were great admirers. The earliest dynasties, according to Herodotus, were the Atyadæ and Heraclidæ. Of these the first seems purely mythical, and the second is perhaps a reminiscence of the rule of Hittite conquerors.

Lydia attained its highest prosperity under the third dynasty of the Mermnadæ (c.689-546 B.C.), which was founded by Gyges (q.v.), a member of a noble Lydian family, around whom has gathered a mass of myth. It seems clear that he was an energetic ruler, who extended his power in Asia Minor, and especially sought to open a way to the coast by establishing his suzerainty over the Greek colonies on the Ægean. His progress was checked by the Cimmerian invasion, which so seriously imperiled his safety that he sought the help of the Assyrian King, Assurbanipal, to whom he paid tribute. Later he fell before the invaders, but his son Ardys finally threw off their yoke and resumed the attacks on the Greek cities. The policy was continued by Sadyattes and Alyattes, under whom the conquest of Asia Minor seems to have been completed. The latter's war with the Medes was settled in B.C. 585, by a treaty fixing the river Halys as the eastern boundary of his realm. Lydian government of the Greek cities seems to have been merely nominal, and the Ionians were willing to pay tribute in return for the large advantages in trade. This friendly policy was continued by the last king of this race, the famous Crœsus (q.v.), until his overthrow by Cyrus in B.C. 546. The subsequent history of Lydia as a Persian province and as subject to Greeks and Romans is unimportant.

The only important remains of native Lydian art are the great tumuli, near the Gygæan Lake, which mark the graves of the kings. The religion was that common in Phrygia and throughout Asia Minor: the worship of a great nature goddess, the 'mother of the gods;' a nature god, Sabazios, honored by wild orgies; a god of heaven, identified by the Greeks with Zeus; a moon-god, Men; and in some places a sun-god. The cult was, in general, orgiastic, and the worshipers often mutilated themselves. Consult: Radet, *La Lydie et le monde grec au temps des Mermnades* (Paris, 1893); Ramsay, *Historical Geography of Asia Minor* (London, 1890); Perrot and Chipiez, *Histoire de l'art dans l'antiquité*, vol. v. (Paris, 1890; English translation, New York, 1892); Buresch, *Aus Lydien* (Leipzig, 1898); "Coins," in Head, *Catalogue of the Greek Coins of Lydia* (London, 1901), vol. xxii. of the British Museum Catalogue.

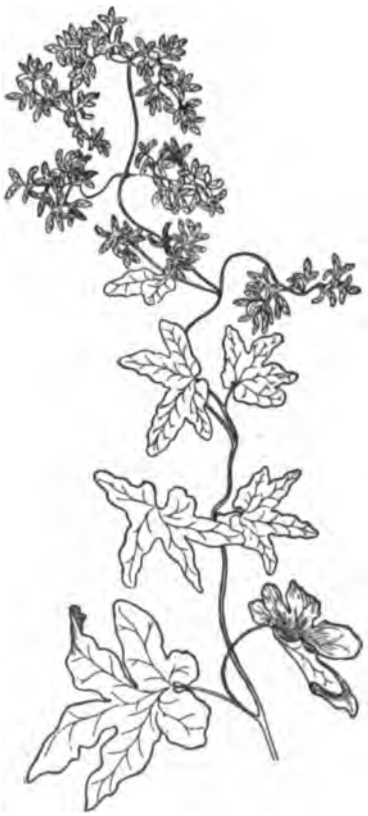
LYDIA LANGUISH. A romantic girl in Sheridan's *Rivals*, devoted to sentimental novels, from which she draws her standards of real life. She is sought by Captain Absolute under the disguise of Ensign Beverley.

LYE (AS. *lēah*, OHG. *louga*, *lauga*, Ger. *Lauge;* connected with Icel. *laug*, warm bath, and ultimately with Lat. *lavare*, *luere*, Gk. λούειν, *louein*, to wash). A term applied to the alkaline solution obtained by treating ashes with water.

LY'ELL, Sir CHARLES (1797-1875). One of the most eminent contributors to geological science. He was born at Kinnordy, Scotland, the son of Charles Lyell, who attained some distinction as a scientist and student of Dante. He received his early education at Midhurst and entered Exeter College, Oxford, where his interest in science was awakened by attendance upon the lectures of Dr. Buckland. After receiving the degree of M.A. in 1821 he was entered as student at Lincoln's Inn, and in due time was called to the bar. While pursuing his professional duties he was a frequent contributor to scientific journals and took an active part in the meetings of the Geological and Linnæan Societies of London. The value of his work was confirmed by election to a fellowship in the Royal Society in 1826, as well as by commendatory notices from Cuvier, Humboldt, and other savants of the day. In 1828, for the purpose of broadening his knowledge of science, he accompanied Sir Roderick Murchison on a tour of Europe. While traveling in Sicily he remarked the evidences of recent elevation of the island, which strengthened his belief in the theory that great geological changes do not require catastrophic agencies for their accomplishment; and he worked out a stratigraphic division for the Tertiary formation based upon the relative proportion of living to extinct species of mollusks found in the rocks. The first volume of his great work, *Principles of Geology*, appeared in 1830, the second in 1832, and the third in 1833. A third edition of the whole work was published in 1834, and other editions were issued in rapid succession. In 1835 Lyell was elected president of the Geological Society of London. He visited the United States in 1841, when he lectured before the Lowell Institute in Boston, and again in 1845-46; the results of his scientific and political studies during his visits to America were embodied in book-form. He was knighted in 1848, and later he received a baronetcy. He was elected to membership in many foreign scientific societies, and served as president of the British Association for the Advancement of Science. He died in London, February 22, 1875, and was buried in Westminster Abbey.

Lyell has justly been called the founder of modern geology. While not the originator of the doctrine of uniformitarianism (q.v.), he was its stanchest and ablest advocate, and was completely successful in securing its universal adoption by geologists. Lyell was also influential in securing recognition for Darwin's theory of evolution, which in a way was but the logical outcome of the *Principles of Geology.* In addition to this great work, which has passed through twelve editions, Lyell contributed over 75 papers to various society journals, and also wrote the following extended works: *Elements of Geology* (1838); *Travels in North America, with Geological Observations* (1845); *A Second Visit to the United States of North America* (1849); *The Antiquity of Man* (1863); and *The Student's Elements of Geology* (1871). For an estimate of Lyell's services to science, consult: Geikie, *The Founders of Geology* (London, 1897); for an account of his life, consult *Life and Letters of Sir Charles Lyell*, edited by Mrs. Lyell, his sister-in-law (London, 2 vols., 1881); and also consult the letters to and from Charles Darwin in the volumes of Darwin's correspondence (1903).

LYGO'DIUM (Neo-Lat., from Gk. λυγώδης, *lygōdēs*, withy-shaped, from λύγος, *lygos*, withy + εἶδος, *eidos*, form). A genus of climbing ferns, with twining or climbing fronds which bear stalked and variously lobed free-veined divisions in pairs. Several species are natives of warm countries; only one (*Lygodium palmatum*) is found in North America, its range being from



LYGODIUM PALMATUM.

Massachusetts to Kentucky, south of which it is rare, and much more abundant in Kentucky than eastward. The fronds are from one to four feet high, and spring from slender running rootstocks, climbing upon other plants. It is a very delicate and graceful fern, and is much used for ornamental purposes, both fresh and dried. It grows in shaded or moist grassy places. It is frequently called Hartford fern from its former abundance near Hartford, Conn. Other species are in cultivation, especially *Lygodium japonicum*.

LYKEWAKE. See MORTUARY CUSTOMS.

LYLY, lĭl′ĭ, JOHN (c.1554-1606). An English romancer and dramatist, born in Kent, about 1554. He graduated at Magdalen College, Oxford, in 1573, and became M.A. in 1575, and was incorporated M.A. at Cambridge in 1579; went to London and strove unsuccessfully to win a place at Court; secured the patronage of Lord Burghley, who gave him some post in his household; took part in the Martin Marprelate controversy, contributing a tract entitled *Pappe with an Hatchet* (1589); was elected to Parliament in 1589, 1593, 1597, and 1601; and died November, 1606. Lyly became famous on the publication of *Euphues* (part i. 1579; part ii. 1580), which added a new word, *euphuism* (q.v.), to the English language. The style of this romance runs riot in alliteration, antitheses, and similes from mythology and fabulous natural history. Lyly was followed by a large number of writers in this style, known as Euphuists, among whom were Greene and Lodge. Lyly also wrote eight plays which were performed at Court by companies of children. They are, in the order of publication: *Alexander and Campaspe* (1584); *Sapho and Phao* (1584); *Endimion* (1591); *Gallathea* (1592); *Mydas* (1592); *Mother Bombie* (1594); *The Woman in the Moone* (1597); and *Love's Metamorphosis* (1601). These plays are mostly on mythological themes, and, except *The Woman in the Moone*, are in prose. The plays written by Lyly, Peele, Greene, Lodge, Marlowe, Kyd, Nash, and Shakespeare before 1596 were in prose, in rhyme, and in blank verse mixed with prose and rhyme. Before 1587, when Marlowe in his *Tamburlaine* made blank verse so beautiful and fitting as to overcome other dramatic styles, prose and rhyme had prevailed. By writing much of his eight dramas in prose Lyly established its use, and his example was followed by Shakespeare. They are interspersed with graceful lyrics. Lyly's charming songs, scattered through his dramas, are the forerunners of the lyrics in Shakespeare and other dramatists. The 'quips and cranks,' repartees and similes of Lyly also were models for a like play of fantastic dialogue in Shakespeare. Consult: *Dramatic Works*, ed. by Fairholt (London, 1858); *Endymion*, with introduction and full bibliography by Baker (New York, 1894); reprints of *Euphues* by Arber (London, 1868) and by Landmann (1st part, Heilbronn, 1887); and *The Works of John Lyly*, edited by Warwick Bond (New York, 1902). For Lyly's sources, consult: Landmann, *Der Euphuismus* (Giessen, 1881); his article in New Shakespeare Society Publications (London, 1880-85). Consult, also, Friedrich Lauchert, *Geschichte des Physiologus* (Strassburg, 1889). Landmann thinks Lyly derived his style from Guevara's *Golden Book of Marcus Aurelius*, which passed from the Spanish through a French version into English. Some of the characteristics of euphuism may be found in George Pettie's *Palace of Pleasure* (1576). For euphuism in Shakespeare, consult Rushton, *Shakespeare's Euphuism* (London, 1871).

LYMAN, lī′man, BENJAMIN SMITH (1835—). An American mining engineer and geologist, born in Northampton, Mass. He graduated at Harvard in 1855, and afterwards studied at the Ecole des Mines in Paris (1859-60), and at the Freiberg Mining Academy (1860-62). In 1870 he surveyed oil-fields for the Public Works Department of the Government of India, and three years afterwards was chief geologist and mining engineer to the Japanese Government. He was assistant on the Pennsylvania geological survey from 1887 until 1895. His publications include: *General Report on the Punjaub Oil Lands* (1878); *Preliminary Report on the First Season's Work of the Geological Survey of Yesso* (1874); *A General Report on the Geology of Yesso* (1877); and *Geological Survey of Japan*.

LYMAN, CHESTER SMITH (1814-90). An American astronomer, born at Manchester, Conn. Educated for the ministry, he became pastor of a Congregational church at New Britain, Conn. In 1845 he went to the Sandwich Islands and was appointed instructor at the Royal School. In 1847 he proceeded to California and engaged in surveying. He returned to the East in 1850 and took up the study of the mathematical sciences, for which he had evinced a strong aptitude when scarcely fifteen years old. In 1858 he became professor of industrial mechanics and physics at Yale, in 1871 was made professor of astronomy and physics, and taught astronomy alone from 1884 to 1889, when he retired with the title of emeritus professor. Dr. Lyman contributed interesting papers to the *American Journal of Science* and the *New Englander*, and produced several valuable inventions, including the combination zenith-telescope and transit for latitude, longitude, and time.

LYMAN, HENRY (1809-34). A missionary. He was born at Northampton, Mass.; was graduated at Andover Theological Seminary in 1832; studied medicine; went, together with the Rev. Samuel Munson, in 1833 as a missionary of the American Board to the Indian Archipelago. Having visited Batavia, Padang, the Battoo group, and Pulo Nigas, the two missionaries undertook to reach the Battas in the interior of Sumatra. Wars prevailed among the tribes, and at the village of Sacca the missionaries were regarded as enemies and murdered. Mr. Lyman was the author of a book on the *Condition of Females in Pagan Countries* (1832). For his life, consult the memoir by his sister (New York, 1857).

LYMAN, PHINEAS (1716-74). An American soldier, born at Durham, Conn. He graduated at Yale in 1738, was a tutor there until 1741, studied law and began practice at Suffield, then within the boundaries of Massachusetts. He soon acquired considerable legal reputation and political influence, which was increased in 1749 by his success in advocating the detaching of Suffield from Massachusetts and its annexation to Connecticut. From 1749 to 1755 he was a member of the Upper Chamber of the Connecticut Legislature. In March, 1755, he was appointed a major-general and was made commander-in-chief of the Connecticut militia force of 1000 men, which participated in the unsuccessful expedition against Crown Point (q.v.). He then constructed Fort Edward (q.v.), named at first, after him, Fort Lyman, but renamed by order of Gen. William Johnson (q.v.), the leader of the expedition, who was jealous of Lyman's popularity. At the battle of Lake George (September 8, 1755) Lyman, after Johnson had received a slight wound, took command of the forces, and repulsed the attack of the French and Indians. Lyman was for a time in 1757 in command of Fort Edward, and in 1758 commanded the Connecticut forces in the expedition of General Abercrombie which resulted in the disastrous repulse at Ticonderoga. The following year he was with Lord Amherst at the capture of Crown Point and Ticonderoga, and in 1760 took part in the expeditions to Oswego and Montreal. In 1762 he commanded the colonial contingent of Lord Albemarle's army in the capture of Havana. In the next year he went to England, where he remained until 1772, endeavoring to obtain a grant of land in West Florida. In this he was at last successful, a tract near Natchez (now Mississippi) being granted by royal charter. Lyman led a band of settlers to the region in the next year.

LYMAN, Theodore (1792-1849). An American philanthropist, politician, and author, born in Boston. He graduated at Harvard in 1810; visited Europe (1812-14); studied law; and, with Edward Everett, revisited Europe in 1817-19. From 1819 to 1822 he was aide-de-camp to the Governor of Massachusetts and became bridadier-general of militia in 1823; from 1820 to 1825 he served in the State Legislature, and from 1834 to 1835 he was Mayor of Boston. He was a steadfast opponent of the radical abolitionists, and in August, 1835, presided over a proslavery meeting in Boston; though a few weeks later, during an anti-abolitionist riot, he rescued William Lloyd Garrison from the mob and confined him in jail to save his life. He was a liberal benefactor of the State Horticultural Society, and of the Farm School, and was the founder of the Reform School, to which, altogether, he gave $72,000. He published: *Three Weeks in Paris* (1814); *The Political State of Italy* (1820); *Account of the Hartford Convention* (1823), in which he defended those who were concerned in that convention; and *The Diplomacy of the United States with Foreign Nations* (1828), a work which is still valuable for the period covered.

LYMAN, Theodore (1833-97). An American naturalist, son of Theodore Lyman (q.v.). He was born at Waltham, Mass.; graduated at Harvard in 1855, and at the Lawrence Scientific School of the university in 1858; and from 1863 to 1865 was aide-de-camp, with rank of lieutenant-colonel, on the staff of Gen. G. G. Meade. As Massachusetts fish commissioner (1865-82), he conducted the first experiments made by any of the States regarding the preservation and development of food-fishes. He served from 1883 to 1885 in the House of Representatives as an Independent and a civil-service reformer. His scientific work was largely on the Radiata, his researches having for the most part been made in the Museum of Comparative Zoölogy at Harvard, where he was appointed assistant in 1860, and to which he presented his valuable collection of technical books. He is distinguished for his papers on the Radiata. His publications include: an *Illustrated Catalogue of the Ophiuridæ and Astrophytidæ in the Museum of Comparative Zoölogy* (1865); *Old and New Ophiuridæ and Astrophytidæ* (1874); and *Report on the Ophiuridæ Dredged by H. M. S. Challenger During the Years 1873-76* (1882).

LYME-GRASS (*lyme*, obsolete spelling of *lime* + *grass*), *Elymus*. A genus of grasses of which there are about 30 species, natives of the temperate and colder regions of the Northern Hemisphere. The sea lyme-grass (*Elymus arenarius*), frequent on the sandy shores of various parts of Europe, and on both the Atlantic and Pacific coasts of North America, is a coarse, grayish grass, often three or four feet high, with spiny-pointed leaves and upright close spikes; a perennial with creeping roots, very useful in binding the sand. In Iceland the seed, which is large, is collected and ground into meal, which is made into porridge or soft thin cakes, and is esteemed a great delicacy. Its stems are used in various countries for thatch. A closely allied species or a variety, called giant lyme-grass (*Elymus giganteus*), is often sown in Holland, being preferred for its more vigorous growth. Various expedients are adopted to secure the growth of lyme-grass in very loose sands, as the laying down of pieces of turf, a gradual advancement from the margin of the sand, etc. The soft sea lyme-grass (*Elymus mollis*) is common about the Great Lakes, on the Atlantic, and along the Pacific Ocean, from Oregon to Alaska. It is useful as a sand-binding grass, as a thatch, and in Alaska it has been very successfully employed as silage for cattle. There are several species indigenous to the Rocky Mountain region that are extensively used for hay. The principal species are *Elymus condensatus* and *Elymus Macounii*. They grow in wet meadows and along streams, the first species often attaining a height of 5 to 10 feet, the other from 2 to 4 feet. When used for hay they must be cut while young. The seeds are used for food by the Indians.

LYME-REGIS, līm′ rē′jĭs. A seaport town in Dorsetshire, England, at the mouth of the Lynn, 22 miles west of Dorchester (Map: England, D 6). It is chiefly noted as a summer watering-place. It owns its water-supply and supports technical education. It is mentioned repeatedly in English history from the Domesday Book onward. The ichthyosaurus and plesiosaurus were discovered here in the Lias rocks. Population, in 1891, 2365; in 1901, 2100. Consult Roberts, *History of Lyme-Regis* (London, 1834).

LYMPH (Lat. *lympha*, OLat. *lumpha*, Oscan *diumpa*, clear water; connected with *limpidus*, clear, Gk. *λάμπειν*, *lampein*, to shine). The term applied by physiologists to the fluid contained in the lymphatics (q.v.). It is a colorless or faintly yellowish-red fluid, of a rather saltish taste, and with an alkaline reaction. It coagulates shortly after its removal from the living body, and forms a jelly-like, semi-solid mass, which continues for some time to contract, so that at last the clot is very small, in proportion to the expressed serum. On microscopic examination, the lymph is seen to contain corpuscles which do not in any respect differ from the colorless blood-cells, molecular granules, fat-globules, and occasionally blood-corpuscles. The chemical constituents of lymph seem to be precisely the same as those of blood, excepting the substance peculiar to the red corpuscles.

The lymph seems to owe its origin to two distinct sources, viz. to the ultimate radicles of the lymphatic system, which contribute the homogeneous fluid portion, and the lymphatic glands, which contribute the corpuscles, granules, etc., seen under the microscope.

The lymphatics convey the lymph into the *receptaculum chyli*, a long pouch which lies along the spinal column, or into the thoracic duct, which is a prolongation of the pouch, and finally empties into the left subclavian vein. The lymphatics of the intestine carry chyle, during the process of digestion, which they empty into the *receptaculum*. They are known as lacteals. From experiments on animals, it has been inferred that upward of 28 pounds of lymph and chyle pass daily into the blood of an adult man. The uses of the fluid are twofold: in the first place, to convey from the tissues to the blood effete matters, to be afterwards excreted by the skin, lungs, and kidneys; and secondly, to supply new materials for the formation of blood.

The term lymph has been applied to the fluid taken from the vaccinia vesicle and employed in vaccination (q.v.). It has also been applied to serums prepared from cultures of bacteria and used in inoculating for the prevention or treatment of various germ diseases. (See ANTITOXIN; SERUM THERAPY.) The name was also given in 1890 to the preparation made by Robert Koch (q.v.) from cultures of the tubercle bacilli, and used as a test for the presence of tuberculosis. This preparation was called Koch's lymph, or tuberculin. See TUBERCULOSIS.

Beginning about 1899, a substance called 'goat-lymph' came into vogue among the ignorant and credulous, to which was ascribed marvelous recuperative powers. It was claimed to be a cure for the debility of age. This 'lymph' is a fluid obtained by macerating goats' testicles in fluid, and is a copy of the old and discredited 'Brown-Séquard's elixir.' (See BROWN-SÉQUARD.) In such a fluid there exist certain ptomaines, which cause a temporary stimulation when injected into the body and taken up by the circulation. See LYMPHATIC.

LYMPHATIC. A vessel containing lymph (q.v.), also called an *absorbent*, from the property which it possesses of absorbing foreign matters into the system and carrying them into the circulation. The lymphatic system includes not only the lymphatic vessels and the glands through which they pass, but also the lacteals (q.v.), which are nothing more than the lymphatics of the small intestine, and only differ from other lymphatics in conveying chyle (q.v.) instead of lymph during the latter part of the digestive process.

The lymphatics are minute, delicate, and transparent vessels, of tolerable uniformity in size, and remarkable for their knotted appearance, which is due to the presence of numerous valves, for their frequent dichotomous divisions, and for their division into several branches before entering a gland. They collect the products of digestion and the products of worn-out tissues, and convey them into the venous circulation near the heart. They are found in nearly every texture and organ of the body, excepting the substance of the brain and spinal cord, the eyeball, cartilage, tendon, and certain fœtal strictures, and possibly also the substance of bone.

The lymphatics are arranged in a superficial and a deep set. The superficial vessels on the surface of the body lie immediately beneath the skin, and join the deep lymphatics in certain points through perforations of the deep fascia; while in the interior of the body they lie in the submucous and subserous areolar tissue. They arise in the form of a network, from which they pass to lymphatic glands or to a larger trunk. The deep lymphatics are larger than the superficial, and accompany the deep blood-vessels; their mode of origin is not known with certainty. The structure of the lymphatics is similar to that of veins and arteries.

The lymphatic or absorbent glands are small, solid, glandular bodies, varying from the size of a hemp-seed to that of an almond, and situated in the course of the lymphatic vessels. They are found in the neck (where they often become enlarged and inflamed, especially in scrofulous subjects), in the axilla, or armpit, in the groin (where, when inflamed, they give rise to the condition known as *bubo*), and in the ham; while deep ones are found abundantly in the abdomen and the chest.

The lymph of the left side of the trunk, of both legs, of the left arm, and the whole of the chyle is conveyed into the blood by the thoracic duct, while the lymph of the right side of the head, neck, and trunk, and of the right arm enters the circulation at the junction of the axillary and internal jugular veins on the right side, by a short trunk, guarded at its opening by valves.

Among affections involving the lymphatic system are inflammation of the lymph-glands in scrofula; swelling of the lymph-glands in pulmonary cancer, in tuberculosis, and in inflammation of the mouth and tongue; tumors involving the lymph-glands; lymphosarcoma, leucocythæmia, etc.

LYN'CEUS. (1) In Greek mythology, a son of Aphareus, famed for his powers of sight. He was a participant in the Caledonian Hunt and the Argonautic Expedition, and was slain by Pollux. (2) The husband of Hypermnestra, and the only one of the fifty sons of Ægyptus whose life was spared by his wife.

LYNCH, CHARLES (1736-96). An American pioneer, politician, and soldier. He was born at Chestnut Hill in Virginia. When nineteen years old he became one of the pioneers of Bedford County. In 1767 he was elected to the House of Burgesses, and it was largely due to his influence that Virginia sent those instructions to her delegates in Congress which led to the Declaration of Independence. In 1774 he was elected justice of the peace, and in 1778 was appointed colonel of militia. It was in both these characters that he acted when, in 1780, just as he was about to lead his cavalry regiment to assist in repelling the British invasion, a formidable conspiracy was discovered among the Tories of Bedford County. He employed his troops to secure the ringleaders, and then, as justice of the peace, condemned them to terms of imprisonment, as that was the only way of keeping them out of mischief during the absence of the local military. In taking this action, however, he clearly exceeded the limit of his powers, and when, after the fall of Yorktown, he returned, the Tories threatened to prosecute him. Lynch appealed to the Legislature, and that body passed an act admitting the illegality of his action, but, in consideration of the circumstances, exonerating him. By many the term 'Lynch law' is thought to have originated through his procedure. Consult Page, "The Real Judge Lynch," *Atlantic Monthly*, vol. lxxxviii. (Boston, 1901).

LYNCH, John Joseph (1816—). A Canadian Roman Catholic archbishop, born in Ireland. He was educated in Dublin and Paris, and in 1843 was ordained a priest. After being a professor for three years in the College of Castleknock, he came to the United States and began missionary work at Houston, Tex. Afterwards he went to Missouri and became president of the Lazarist College of Saint Mary the Barren, in that State. He afterwards went to Canada, founded the Seminary of Our Lady of Angels, near Niagara Falls, and in 1860 was appointed Bishop of Toronto. He attended the Vatican Council in 1869, and was made Archbishop of Toronto and Metropolitan of Ontario.

LYNCH, Patricio (1825-86). A Chilean naval officer, of Irish descent, born in Valparaiso. He was educated for the navy, first saw active service in the war with Peru in 1838, and in the following year entered the English navy. He took part in the Chinese War (1840-42), and did not reënter the Chilean navy until 1847. In 1865 he fought in the war against Spain, and was made Governor of Valparaiso. He was in command of an expedition in 1879 and 1880 that destroyed an enormous amount of property in the northern part of Peru, and during the campaign that followed took part in the battle of Chorrillos, the attack on Lima, and the battle of Miraflores. As a reward for his services he was made commander of the Chilean army. He kept strict military discipline in the captured city of Lima, deposed the Calderón Government, and took Calderón himself prisoner despite the objections of the United States Minister. After peace was proclaimed he was promoted to be vice-admiral of the Chilean navy, and Minister to Spain (1885). He died at sea on his return voyage to Chile.

LYNCH, Thomas (1749-79). An American patriot, one of the signers of the Declaration of Independence, born in South Carolina. At the age of fourteen he went to England, where he was educated at Eton and Cambridge, and was admitted to the practice of law in the Inns of Court, London, in 1767. In 1772 he returned to South Carolina, and became active in the Patriot cause. He was appointed captain of one of the provincial regiments in 1775; in 1776 he joined his father in Philadelphia as one of the South Carolina delegates in the Continental Congress.

LYNCH, Thomas Toke (1818-71). An English Congregationalist minister and hymn-writer. He was born at Dunmow, Essex, and was pastor in London from 1847 to his death. His *Hymns for Heart and Voice: The Rivulet* (1855) has furnished some hymns for general use, but most of them were not adapted for singing. Its appearance was the occasion for a controversy, known as 'The Rivulet Controversy,' because it was accused of being pantheistic. Consult his memoir by White (London, 1874).

LYNCH, William Francis (1801-65). An American naval officer, born in Norfolk, Va. In 1848 he conducted a valuable official survey of the Jordan River and the Dead Sea. He became commander in 1849 and captain in 1856, resigning in 1861 to enter the Confederate service, in which he attained the rank of commodore. He published *Narrative of the United States Expedition to the River Jordan and the Dead Sea* (1849); and *Naval Life, or Observations Afloat and On Shore* (1851).

LYNCH'BURG. A city in Campbell County, Va., 124 miles west by south of Richmond and 172 miles from Washington, D. C.; on the James River, and on the Chesapeake and Ohio, the Norfolk and Western, and the Southern railroads (Map: Virginia, E 4). The situation of the city is remarkably picturesque. A steep acclivity rises from the banks of the river, breaking into numerous hills, whose terraced walls, ornamented with trees and skirting handsome dwellings, present an attractive appearance. In the background, at a distance of twenty miles but prominently in view, rise the Blue Ridge and the Peaks of Otter. There are about ninety acres in public parks. The city is the seat of the Randolph Macon Woman's College, and has the Miller Female Orphan Asylum and two well-equipped hospitals. Lynchburg is the centre of enormous tobacco manufactures, and, on account of its excellent railroad facilities, controls important jobbing and shipping interests. Vast fields of coal and iron ore are in the immediate neighborhood, also quarries of granite. Besides the tobacco factories, there are iron and brass foundries, flour mills, cotton mills, shoe factories, pipe works, dye works, and manufactories of bark extract, hardware, plows, wagons, and textiles. The city possesses water power estimated at 2000 horse power, with 5000 more as yet undeveloped. The government, under a revised charter of 1899, is vested in a mayor, elected every two years, and a unicameral council in which rests appointments to the majority of administrative offices. The clerk of courts, commissioner of revenue, and city treasurer are, however, elected by the people. Lynchburg owns and operates the water works. Population, in 1890, 19,709; in 1900, 18,891.

Founded in 1786 by John Lynch, Lynchburg was first incorporated in 1823. During the Civil War it was used by the Confederates as a base of supplies, and on June 18, 1864, the Federal General Hunter made an unsuccessful attempt to capture it. Consult Cabell, *Sketches and Recollections of Lynchburg* (Richmond, Va., 1858).

LYNCH LAW. In the United States, a term applied to the summary method of inflicting punishment for certain offenses without authority of law. Formerly the term was applied to any unauthorized punishment, but now it is restricted mainly to punishment by death. The origin of the term is surrounded by obscurity. The most generally accepted explanation associates the beginning of the practice with one Charles Lynch (q.v.), a Virginia planter, who undertook to maintain order by taking into his own hands the punishment of all disorderly or disaffected persons. This method of dealing with the lawless element met the approval of public opinion and was practiced after the Revolution with the result, it is said, that many suits were before the courts in 1792 for inflicting lynch law in the region south of the James River. In England lynch law was early known by the name of Lydford law; in Scotland it was often called Cowper law. Except in the early settlement of California before civil government had been established, the practice of lynching in the United States was seldom resorted to until after the Civil War. In the disorders incident to the emancipation of the slaves and the enforcement of the reconstruction acts, bands of white men under the name of the Ku-Klux Klan (q.v.) frequently resorted to lynch law to get rid of objectionable colored men. The demoralization and disregard of the majesty of the law which the influences of the time created in the minds of the white race did not disappear with the restoration of white supremacy in the South. With the increasing amount of crime among the black race went an increase in the number of lynchings. Presently it became an unwritten law that no colored offender charged with rape upon a white woman should be allowed the privilege of trial before a court of law. The method of punishment by lynching is not now restricted to the offense of rape, as the statistics quoted below will show. Moreover, it is not wholly confined to any particular section of the country, although more general in the South than in other parts of the country. It is also resorted to more frequently in the newly settled West than in the older North and East. Reliable statistics gathered for the year 1892 show that 241 persons were executed in the United States by lynching during that year. All of these cases except 38 occurred in the former slave-holding States of the South, Louisiana heading the list with 29, Tennessee following with 28, Arkansas with 25, Alabama with 22, and Mississippi with 16. Of the 241 victims of lynch law 160 were negroes. While the offense charged was in 57 cases rape or attempt at rape, in 58 cases it was murder; in 18 cases the offense was equally divided between race prejudice, robbery, and incendiarism; in four instances it was suspected robbery, and in two cases the charge was insulting women. During the year 1902 the number of lynchings reported was but slightly more than 100, which was 21 less than the number reported during the previous year. Nine of these cases occurred in the northern section of the country—one each in South Dakota, Colorado, Wyoming, Michigan, Oregon, Indiana, and Kansas, and two in Illinois. Under the Constitution the National Government has little or no power which can be employed to check the barbarous practice of lynching. The administration of the criminal law, except in a few cases, is left to the individual States, and the punishment of those who are guilty of taking part in the business of lynching is the duty of the States. Nevertheless, whenever the subject of a foreign government is lynched by an American mob, the United States is held responsible and has on several occasions been called upon to pay an indemnity to the families of victims of lynch law. This happened twice in the case of several Chinese subjects who were lynched by mobs in Wyoming and California, and twice in the case of Italians lynched in Louisiana and California. The total amount of the indemnity paid in these cases exceeded $250,000. Recently there has been a marked increase in the activity of the State governments in several quarters with a view to checking the growth of mob law. Several of the present executives of States where the practice of lynching is most frequent have made earnest appeals to the legislatures of their respective commonwealths to enact extraordinary measures to meet the situation, and they have, in a number of cases, foiled the attempts of lynching mobs by prompt use of the militia. Several States, notably Ohio and South Carolina, have enacted laws making the county in which a lynching occurs responsible in pecuniary damages to the family or heirs of the person lynched, while in Indiana and Kansas laws have been passed which provide for the suspension from office of sheriffs who fail to protect citizens of their respective counties from the violence of mob law. These measures have not proved to be adequate. The remedy most generally advocated for the suppression of lynch law is the just, prompt, and efficient activity of the courts in bringing to speedy justice persons guilty of the offenses for which lynching is usually resorted to. But public sentiment in those parts where lynchings are most frequent is too strong against publicity of trial where the honor of a woman is involved to allow the courts to inflict the punishment which the offender is believed to deserve. Moreover, the recent action of mobs in several instances in lynching criminals who had been duly convicted by the courts and sentenced to death shows that the remedy suggested will scarcely be effective. The conviction and punishment of persons guilty of taking part in lynchings is of the rarest occurrence, owing to the sympathy of the juries with the guilty parties.

LYNDHURST, lĭnd′hĕrst, Lord. A British lawyer and statesman. See Copley, John Singleton.

LYNDSAY, lĭn′zĭ, Sir David. A Scottish poet. See Lindsay.

LYNEDOCH, Thomas Graham, Lord (1748-1843). A British general, born in Balgowan, Perthshire, where he was trained by private tutors, preparatory to a brief course at Christ Church, Oxford. In 1793 he volunteered in the army, and was elected to Parliament. He completed the siege of Valetta in 1800; served under Sir John Moore in Portugal in 1808-09; and in 1811 gained the brilliant victory of Barossa over the French. He took part in the siege of Ciudad Rodrigo (1812), in 1813 fought at Vittoria and Toloso, was unsuccessful in his assault on Saint Sebastian, and commanded the British force which settled in October on French territory. In 1814 he was again fighting at Merxem and Bergen-op-Zoom, and was made a baron with an annual pension of £2000, which he refused. Consult Graham's biography (Edinburgh, 2d ed., 1877), and that by Delavoge (London, 1880).

LYNN, lĭn. An important manufacturing city in Essex County, Mass., 12 miles northeast of Boston; on Massachusetts Bay, and on the Boston and Maine and the Boston, Revere Beach and Lynn (narrow gauge) railroads (Map: Massachusetts, F 3). The city, 11 1-3 square miles in extent, is near several seaside resorts. It has a shore line of about three miles and a safe, though shallow, harbor. There are a fine City Hall, a children's home, Lynn Home for Aged Women, Lynn Hospital, a public library with about 60,000 volumes, a Soldiers' Monument, and Forest Park. Lynn is noted for its manufacturing interests, particularly in the line of boots and shoes, an industry which dates from 1750 and gradually has grown to great importance. Other extensive manufactures are morocco and leather, shoe manufacturers' supplies, electrical appliances, machinery, foundry and machine-shop products, and patent medicines.

The city spends annually in maintenance and operation nearly $1,350,000, the principal items of expenditure being $245,000 for schools, $105,000 for charitable institutions, $95,000 for the fire department, $85,000 for the police department, $65,000 for the water-works, and $55,000 for municipal lighting. Lynn owns and operates the water-works, which were built in 1870 at a cost of nearly $2,500,000, the entire system now comprising 115 miles of mains. Population, in 1800, 2837; in 1850, 14,257; in 1870, 28,233; in 1880, 38,274; in 1890, 55,727; in 1900, 68,513, including 17,742 persons of foreign birth and 784 of negro descent. Settled in 1629, Lynn was known as Saugus until 1637, when its present name was adopted from Lynn Regis, England, the home of the second pastor, Samuel Whiting. In 1850 Lynn was organized as a city. Consult Newhall, *History of Lynn, Massachusetts* (Lynn, 1883).

LYNN REGIS, lĭn rē'jĭs, or KING'S LYNN. A seaport in the County of Norfolk, England, three miles from the mouth of the Great Ouse, and 41 miles northwest of Norwich (Map: England, G 4). It has fine ecclesiastical buildings, national schools, and charitable institutions. Its grammar school (where Eugene Aram was usher) was founded in 1510. The town was formerly fortified and defended by a moat, which, with ruins of the walls and the handsome Gothic 'South Gates,' still exists. The town owns real estate, a water-supply, electric works, and a cemetery, and maintains baths, free library, fire brigade, and a technical school. The industrial establishments include shipyards, oil-mills, machine-shops, iron-foundries, breweries, malt-houses, etc. Lynn received its first charter from King John in 1204. It was known as Lynn Episcopi, Bishop's Lynn, which at the Reformation was changed to Lynn Regis, or King's Lynn. Population, in 1891, 18.300; in 1901, 20,300. Consult: Richards, *History of Lynn* (Lynn, 1812); Harrod, *Records of King's Lynn* (Lynn, 1874).

LYNX (Lat. *lynx*, from Gk. λύγξ, lynx; connected with Lith. *luszis*, AS. *lox*, OHG. *luhs*, Ger. *Luchs*, lynx, and probably with Lat. *lucere*, to shine, Gk. λεύσσειν, *leussein*, to see, Skt. *ruc*, to shine, OChurch Slav. *lucha*, beam of light, OIr. *lŏche*, lightning, OHG. *lioht*, Ger. *Licht*, AS. *lĕoht*, Eng. *light*). A kind of wild cat, of which those in North America are examples. It differs from the ordinary small cats of the wilderness by having a less elongated, more robust form, with the haunches elevated and all the limbs massive, the tail very short, the fur generally long, in old males forming almost a ruff about the face, and the ears tipped with tufts or pencils of hair. Some naturalists have separated a group of these animals from the genus Felis as a genus Lynx, but there seems no good reason to regard the animal as essentially different throughout the whole of the north temperate zone, or to give it more than the one name, *Felis lynx*. In the Old World the lynx was once a general inhabitant of the Arctogæan region, but to-day it is never seen south of the Baltic, except in Spain, where it is represented by a highly spotted form, the pardine lynx (*Felis pardalina*), which Mivart (*The Cat*, New York, 1892) concluded to be a separate southern species. The lynx may be found throughout all Asia north of the Himalayas, varying much in its colors, according as it dwells in the Siberian forests, or on the dry plains, or amid the Himalayan or Tibĕtan heights. The caracal (q.v.) is a near relative. Its food and habits vary with its habitat, but it is everywhere the strongest and most savage cat of its size, and often kills goats and sheep as well as the smaller prey more usual to it.

In North America the lynx originally inhabited every part of the continent north of an indefinite point in Mexico or Central America. It has been traditional to regard the American lynxes as forming two species—the northern 'red,' or Canada lynx, 'lucivee' (i.e. loup cervier), or 'catamount,' and the southern or 'bay' lynx or 'bobcat.' Both of these are highly variable in size, coloration, and proportion of parts, and, although no less than three species and 11 subspecies are distinguished and named in Elliot's *Synopsis of Mammals* (Chicago, 1901), there seems to be no good reason for treating the American animal as anything but the circumpolar lynx, varied here and there by local influences. The length varies from about 40 inches down to 30 inches, from nose to root of tail. The largest specimens come from the northern forests, while the smallest are those dwelling in the dry, open country of the interior and the far Southwest; but, in accordance with Allen's law, the latter have the limbs and tail longer in proportion to the size of the animal. The color of the Northern lynx is grizzly brownish-gray, the ear-tufts and end of the tail black, and the belly white; those of Newfoundland are a richer brown, and of Alaska paler than the average. Toward the south there appears an increasing tendency to reddishness, which is much brighter in the summer than in the winter coat; and the fur is marked with spottings and lines about the head, which are scant and obscure in the Northern specimens, but very pronounced in those from the Southwest. The pelts find a good sale among furriers.

The habits of lynxes are those of the forest cats generally, and their depredations upon the farmer's poultry, together with the fear inspired by their screams at night and the value of their pelts, have led to their extermination in the more thickly settled States, except in mountain ranges or large tracts of forest or swamp. They are persistent mousers, however, and probably more than repay their occasional thefts by destroying great numbers of injurious rodents. Chiefly nocturnal in their movements, they sleep by day in hollow trees and caverns, and in such places, on a bed of leaves and grass, they bring forth and conceal their kittens, which the mother will defend with a ferocity and skill in fence few animals can withstand. Keen, agile, patient, muscular, and resourceful, the lynx is the terror of the woods in summer, and fares well; but how it is able to endure the lifeless cold of the Northern forests in winter is one of the wonders of nature.

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LYOMERI, lī-ŏm′ē-rī (Neo-Lat. nom. pl., from Gk. λύειν, *lyein,* to loose + μέρος, *meros,* part). An order of eel-shaped fishes, the 'gulpers,' of low organization, allied to the morays, which inhabit the deep sea, and are characterized by looseness and probably degradation of structure. Their jaws are hinged to the cranium by so elastic ligaments, and all the bones of the head and shoulder girdle are so loose and expansible, that objects may be swallowed larger than the fish itself. Two families are recognized, the Saccopharyngidæ and Eurypharyngidæ, each represented in our waters by a single species.

LY′ON, DAVID GORDON (1852—). An American Assyriologist, born at Benton, Ala., and educated at William Jewell College in Missouri, at Howard College, Alabama, and at the University of Leipzig. He became Hollis professor of divinity at Harvard in 1882, and was recording secretary of the American Oriental Society (1886-95), and corresponding secretary of the Society of Biblical Literature (1894-99). He was one of the first Americans to make a special study of Assyriology, and much of his work has marked value. His publications include: *Keilschrifttexte Sargons Königs von Assyrien* (1883), and *An Assyrian Manual for the Use of Beginners* (last ed. 1892).

LYON, GEORGE FRANCIS (1795-1832). An English navy officer and traveler. He was born at Chichester, entered the navy at the age of thirteen, joined the squadron of Lord Exmouth which bombarded Algiers in 1816, and in 1818 accompanied Joseph Ritchie, the traveler, on his expedition to North Africa. After many privations and perils in exploring the Sudan and the Niger, he returned to England in 1820, and in 1821, in command of the *Hecla,* accompanied Capt. Parry on his voyage of discovery to Hudson Bay. In 1824 he made an unsuccessful voyage with the *Griper* to the Arctic regions, and in 1826 he traveled in Mexico. He published *A Narrative of Travels in North Africa* (1821), and *Journal of a Residence and Tour in the Republic of Mexico* (1829).

LYON, JOHN (1514-92). An English yeoman, the founder of Harrow School, born at Preston, Middlesex. He possessed ample means and interested himself in the education of the poor. In 1571 Queen Elizabeth granted him a charter for a free grammar school for boys at Harrow, which was formally opened in 1611.

LYON, MARY (1797-1849). An American educator, through whose influence the movement for the higher education of women was begun. After having taught for a number of years, in 1830 Miss Lyon became interested in the idea of a permanent seminary for girls, but the object was not appreciated. She then proposed to found an institution which should offer a thorough education on terms available to young women of moderate means. To preserve habits of home industry, to inspire a spirit of true independence and wise economy, it was her plan that the domestic tasks of the household should be so divided and arranged that each should perform a daily share without taking more time from study than was necessary to give healthful exercise. No sooner was this design announced than general attention to it was aroused. The money needed was given with enthusiasm. South Hadley, near Mount Holyoke, was chosen as the site of the seminary. In 1837, buildings and necessary accommodations for eighty pupils being nearly completed, the school opened with more than that number. It was afterwards enlarged to receive three hundred pupils. The remaining twelve years of Miss Lyon's life were devoted to this school. She wrote an account of the seminary and a book called *The Missionary Offering.* Consult her life by Edward Hitchcock, 1851. Consult also, Fiske, *Recollections of Mary Lyon* (Boston, 1866). See COEDUCATION; COLLEGIATE EDUCATION FOR WOMEN.

LYON, MATTHEW (1746-1822). An American soldier and politician. He was born in Wicklow County, Ireland, and emigrated to New York in 1759. Unable to pay his passage, he was committed by the captain to a farmer in Connecticut, with whom he served several years. He subsequently removed to Vermont; became lieutenant in a company of 'Green Mountain Boys' in 1775, and was cashiered the latter part of the year for deserting his post. In 1777 he was temporary paymaster of the Northern army and colonel of militia. He founded the town of Fairhaven, Vt., in 1783; built saw-mills and grist-mills, established a forge, and established and edited a paper called *The Scourge of Aristocracy and Repository of Important Political Truth,* making the types and paper himself. For ten years he was a member of the Vermont Legislature, and in 1786 was judge of the Rutland County court. He became a zealous politician, and represented the Anti-Federalists in Congress in 1797 to 1801. In 1798 he was convicted of libel against President Adams, and was imprisoned for four months and fined $1000. While in Congress, he had a violent personal encounter with Roswell Griswold of Connecticut. After the expiration of his term he removed in 1801 to Kentucky, and established the first printing-office in the State. He again sat in Congress from 1803 to 1811; built gunboats on speculation for the War of 1812, and became bankrupt. In 1820 he was appointed by President Monroe United States factor of the Cherokee Indians in Arkansas. Consult McLaughlin, *Matthew Lyon, the Hampden of Congress: A Biography* (New York, 1900).

LYON, NATHANIEL (1818-61). An American soldier, prominent in the contest between the Unionists and Secessionists in Missouri immediately preceding and in the early part of the Civil War. He was born in Ashford, Conn., graduated at West Point in 1841, served as second lieutenant in the Florida War in 1841-42, and in the Mexican War in 1846-47, participating during the latter in all the important battles of the Southern campaign, and receiving the brevet rank of captain. From 1848 to 1861 he was on frontier duty at various posts. He became a captain in 1851, and on February 7, 1861, was placed in command of the United States arsenal in Saint Louis, Mo., where he immediately associated himself with Francis P. Blair, Jr., and other ardent Unionists, for the purpose of balking the schemes of the Secessionists and of preventing the withdrawal of Missouri from the Union. He organized and drilled recruits, took energetic measures to hold the arsenal against threatened attacks, and on April 21st, General Harney being temporarily removed, assumed command of the Department of the West. On May 10th he surprised and captured a force of Secessionists at Camp Jackson in Saint Louis, on May 17th was promoted to be brigadier-general of volunteers, and on May 31st, by the President's appointment, again supplanted Harney as commander of the department. Finally breaking off all friendly relations with Governor Jackson, the leader of the disloyal element in Missouri, he sent troops to the southwestern part of the State to ward off or meet a threatened Confederate attack from Arkansas and intercept the retreating Missouri Secessionists, and himself advanced at the head of a Federal force against the capital, Jefferson City, which he occupied on June 15th. He defeated a Confederate force under General Marmaduke at Boonville on the 17th, and on August 10th attacked a greatly superior body of Confederates under General Price at Wilson's Creek, where, after fighting desperately for some time, he was instantly killed while leading a charge. (See WILSON'S CREEK, BATTLE OF.) His entire fortune, $30,000, was bequeathed to the Federal Government for use in prosecuting the war. A series of able letters, dealing with the political situation in 1860, was published with a memoir soon after his death, under the title, *The Last Political Writings of Gen. Nathaniel Lyon* (1862). Consult: Peckham, *Gen. Nathaniel Lyon and Missouri in 1861* (New York, 1866); Snead, *The Fight for Missouri* (New York, 1886); Carr, *Missouri: A Bone of Contention* (New York, 1888); and Woodward, *Life of General Nathaniel Lyon* (Hartford, 1862).

LYON, THEODATUS TIMOTHY (1813-1900). A noted American pomologist. He was born at Lima, N. Y., but with his parents in 1828 removed to Michigan. While living at Plymouth, Mich., in 1844 he started a nursery and made a study of fruits, particularly with respect to identification of varieties. The results, which were published in the *Michigan Farmer*, led to correspondence with Charles Downing, who acknowledges his assistance in the revision of "Fruits and Fruit Trees of North America." He wrote a *History of Michigan Horticulture*, which appeared in the seventeenth report (1888) of the Michigan Horticultural Society, of which he became president in 1876 and honorary president in 1891, a position he held until his death. The Michigan Agricultural College Experiment Station placed him in 1889 in charge of its fruit investigations at South Haven, where he was engaged until his death.

LYON COURT (obsolete spelling of *lion;* so called from the lion on the royal shield). An inferior court of Scotland, having jurisdiction in questions regarding coat armor and precedency, and also in certain matters connected with the execution of the law. It is presided over by the Lyon king-of-arms or Lord Lyon. Attached to the Lyon Court are a certain number of heralds (q.v.) and pursuivants (q.v.) appointed by him, whose principal duty is now the execution of royal proclamations in Edinburgh, though the heralds were, in old times, to some extent associated with the Lord Lyon in the exercise of his jurisdiction. Lyon appoints the messengers-at-arms (officers who execute the process of the Court of Session); superintends them in the execution of their duty; and in the exercise of his judicial function, takes cognizance of complaints against them, and fines, suspends, or deprives them for malversation. The jurisdiction of the Lyon Court is defined by two acts of the Scottish Parliament, 1592, c. 127, and 1672, c. 21, and further regulated by 30 Vict., c. 17. The Scotch acts authorize the Lord Lyon to inspect the ensigns armorial of all noblemen and gentlemen of Scotland, and oblige all persons who, by royal concession or otherwise, had previously a right to arms, to matriculate or register them in the Lyon's books. He is empowered to inquire into the relationship of younger branches of families having right to arms, and to "assign suitable differences to them, without which the arms cannot lawfully be borne." The later act establishes the now existing register of the Lyon Court as the "true and unrepealable rule of all arms and bearings in Scotland," and authorizes the Lord Lyon to "give arms to virtuous and well-deserving persons," not hitherto entitled to bear them.

The register of genealogies is a department of the Lyon office unconnected with heraldry, where evidence is taken of the pedigree of applicants, irrespectively of noble or humble lineage, and recorded for preservation.

LYON KING-AT-ARMS. The chief heraldic officer of Scotland. He is first mentioned in the early part of the fifteenth century. See HERALD; KING-AT-ARMS.

LYONNAIS, lē'ô'nā'. A former province of France, named after its capital, Lyons, and now comprised in the departments of Rhône, Loire, Haute-Loire, and Puy-de-Dôme. It was an independent countship until 1307, when it was united with the French Crown by Philip the Fair.

LYONNESSE, lĕ'ô-nĕs, **LYONESSE, LEONAIS,** or **LEONNOYS.** A fabulous country mentioned especially in the romances of Tristram and Iseult, supposed to have been contiguous to Cornwall, England. This land of romance has sometimes been identified with the Scilly Isles. Walter Besant laid there the scene of *Armorel of Lyonesse* (1896). See ARTHUR; TRISTRAM; PERCEVAL; LANCELOT OF THE LAKE.

LYONNET, lē'ô'nā', PIERRE (1707-89). A Dutch publicist and entomologist, born at Maestricht. He studied law at Utrecht, and became secretary and official interpreter of the States-General at The Hague. His leisure he devoted to the study of natural history. He produced only one important work, *Traité anatomique de la chenille qui ronge le bois du saule* (The Hague, 1760-62), in which the structure of the caterpillar is described in the minutest detail, and figured in eighteen beautiful plates. This work at once became and has since remained one of the classics of natural history. Another extensive work is *Recherches sur l'anatomie et les metamorphoses de différent espèces d'insects, ouvrage posthume publié par W. de Haan* (Paris, 1832). Lyonnet was also an amateur of ability in sculpture and portrait painting.

LY'ONS (Fr. *Lyon*, Lat. *Lugdunum*). The third city of France in respect to population, and second only to Paris in industrial importance. It is the capital of the Department of the Rhône, and is situated at the confluence of the Rhone with the Saône, 240 miles southeast of Paris and 170 miles north by west of Marseilles (Map: France, L 6). Its position, commanding both the Rhone and the Saône, gives it not only a great commercial, but also an immense strategic importance. It is a military station of the first class, and is surrounded by a circle of fortifications which since 1871 has been improved, extended, and removed farther from the centre of the city, and now has a circumference of 44 miles. The Rhone and the Saône divide Lyons into three parts, the central and most important business section being built on the long, narrow peninsula between the rivers. This peninsula is very low, the southern extremity having been reclaimed from the river in the eighteenth century by the construction of dikes, which along a considerable length of river-front protect the city from inundation. The northern part of the peninsula rises abruptly in the hill of La Croix Rousse, and the west bank of the Saône is high and steep, formed by the rugged hill of the Fourvière, on the slopes of which stands the old part of the city, still preserving its mediæval aspect. Thirteen bridges lead across the Saône to the middle city, whose centre is the Place Bellecour, the principal square, surrounded by fine façades and containing gardens and fountains, and in the centre a statue of Louis XIV. North of this square are the large commercial establishments, and south of of it as far as the Cours du Midi is the aristocratic quarter. The Cours du Midi is a broad opening extending from river to river and planted with trees. South of this, extending to the point of the peninsula, are the large railroad stations, the custom-house, arsenal, prisons, abattoirs, and gas plants. From the middle city nine bridges cross the Rhone to the extensive, modern, and rapidly growing quarter of La Guillotière, which is the home of the great working population, and contains numerous factories. It is encircled by a boulevard which ends north of the city in the large Parc de la Tête d'Or on the bank of the Rhone, a handsome, rustic pleasure-ground, containing a large lake with several islands. At the entrance to the park stands the large Monument des Enfants du Rhône, erected to the memory of the heroes of 1870-71. The Place Carnot contains a monument to the French Republic, and the Place des Terreaux a monumental fountain by Bartholdi.

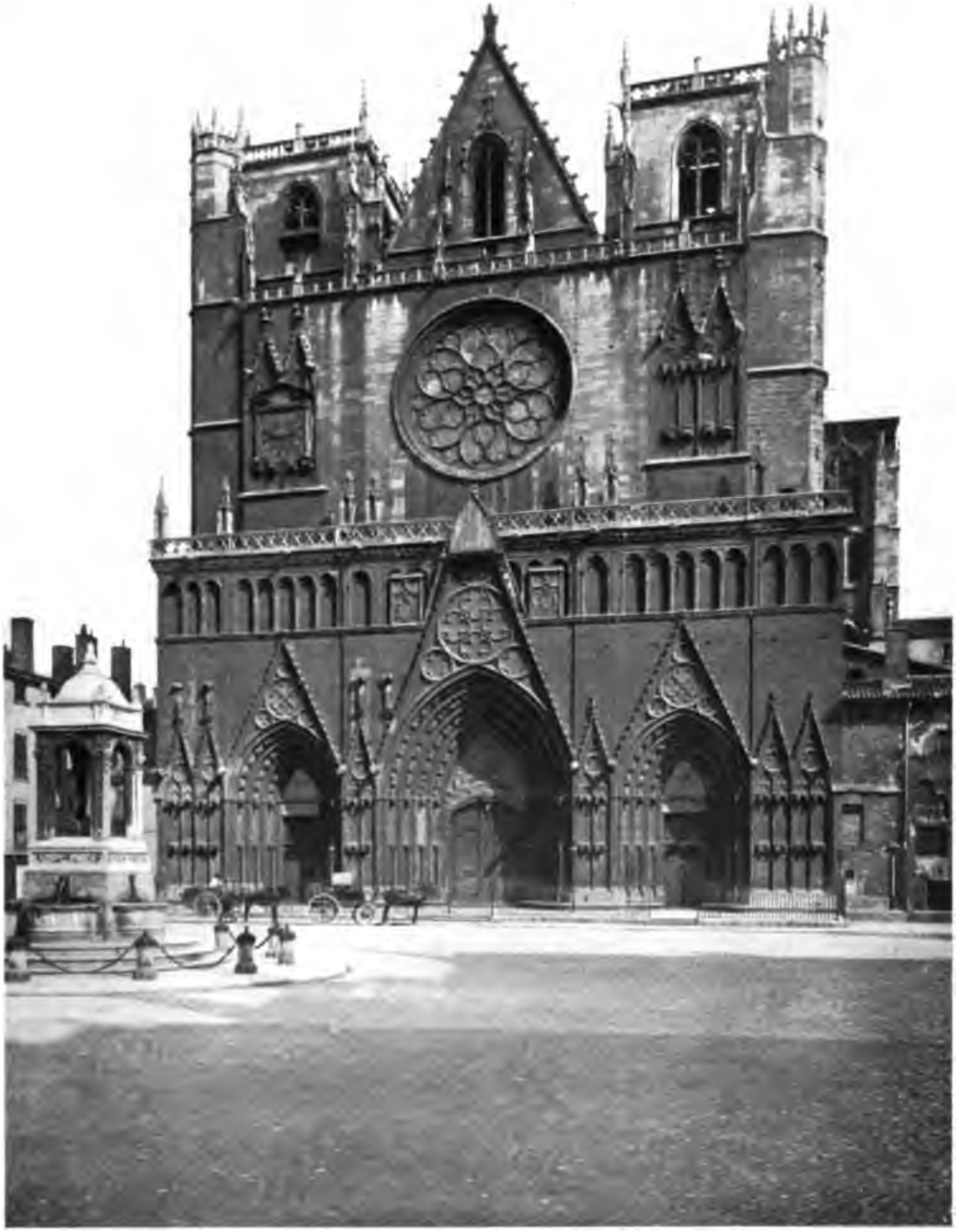
Lyons has preserved the remnants of Roman baths, and of a theatre, several tombs, and portions of the Roman wall and of the aqueducts. The oldest building in the city is the Church of Saint Martin d'Ainay, built on the site of a Roman temple, several columns of which are still preserved in the portal. The Cathedral of Saint Jean is one of the most interesting in France. It was begun in 1110, and continued by various architects till the end of the fifteenth century. The Church of Notre Dame de la Fourvière is a new edifice, finished in 1894, in an eclectic style, with sumptuous decorations. It stands on the summit of the hill west of the Saône, and commands a fine view over the city of the peaks of the Jura and the Savoy Alps. The most prominent public buildings are the handsome Hôtel-de-Ville, built in 1646-55; the Exchange, with a monumental façade, finished in 1861; the Palais des Arts, a vast building, containing a library and various museums; and the Grand Théâtre, whose arcades are occupied by shops.

The University of Lyons ranks next to that of Paris among the French universities in the number of its students, the attendance being about 2600.

Lyons is the stronghold of French Catholicism. By the side of the State University there are four free faculties, science, theology, letters, and law, constituting in reality a Catholic university. In addition there are the Ecole Centrale Lyonnaise, a number of commercial, technical, and industrial high schools, and a national school of fine arts. The Palais des Arts contains the municipal library of 130,000 volumes, and very rich museums of art, archæology, and natural history. The city has nine public hospitals and a large number of asylums and other charitable institutions.

Lyons has been a flourishing industrial centre since the Roman period. Its industries have been fostered from time to time by royal grants of privileges; thus Francis I. granted the workers of Lyons exemption from military service. Although it suffered heavily through emigration after the revocation of the Edict of Nantes, it still retains its place as the chief centre of the silk industry in the world. One-third of all the raw silk produced in or brought to Europe is prepared at Lyons or its immediate surroundings. Two-thirds of this quantity is imported from the Orient, one-eighth comes from Italy, and only one-tenth is produced in France. About one-half of the prepared silk is used in the local industries, the rest being exported. The total value of the silk manufactures of Lyons and the surrounding region in 1899 was $87,674,400, and, with the allied industries, they gave employment to over 200,000 persons. The chief of the allied industries is the manufacture of chemicals, especially of dyes; the annual value of the chemical products amounts to over $10,000,000. There are also extensive iron-works and machine-shops, and establishments for the preparation of leather and skins, while printing has for centuries been one of the distinctive industries. The commerce of the city is also considerable. Lyons is one of the principal railroad centres of France, and the river traffic in 1899 amounted to 1,325,000 tons. The city has 13 miles of quays along the river-fronts, and the width of the Rhone at this point is 625 feet, while that of the Saône is from 250 to 450 feet. The principal trade, besides that in silk products, is in grain and wine, amounting respectively to $30,000,000 and $20,000,000 annually. Lyons is also, next to Paris, the most important financial centre of France. Its exchange is almost independent of that of Paris, and it has large amounts of capital invested in foreign enterprises. At the head of its financial institutions is the Crédit Lyonnais, which has branches in over one hundred cities. The United States is represented by a consul. The population of the city, in 1901, was 450.000. In 1891 the population was 438,077, and in 1801, 109,500, though before 1789 it was over 200,000.

Lyons was an ancient Gallic town with the name of Lugdunum. In B.C. 43 L. Manutius



LYONS
THE CATHEDRAL OF ST. JEAN

Plancus, a lieutenant of Cæsar, founded a Roman colony on the Fourvière Hill, which soon became the chief colony in Gaul, and in A.D. 13 it was made the capital of all the Gallic municipalities, from which deputies gathered annually in the Roman forum built in the city. Christianity rapidly gained ground in the city. In A.D. 197 it was pillaged by the soldiers of the Emperor Severus. In 208 it witnessed a massacre of many thousands of its Christian citizens, and it was deprived of its title of capital. In the Middle Ages the city was for some time under the rule of counts (counts of Lyonnais, counts of Forez), later under that of the Archbishops of Lyons, with whom the inhabitants waged bloody conflicts, and finally, in the fourteenth century, passed under the sway of the French kings. In 1320 it received a municipal charter. Two councils of the Church were held there in 1245 and 1274. In 1793 the people of Lyons rose in insurrection against the terrorism of the Convention. An army was sent against the city, which was taken in October and subjected to a frightful chastisement, thousands of the citizens being massacred at the hands of Collot d'Herbois and Fouché. Many of the finest edifices were demolished. The city gradually recovered under Napoleon, and has since enjoyed prosperity, though it has several times suffered from floods, and in 1831, 1834, and 1871 from labor riots and insurrections. Among a long list of celebrities born at Lyons are the Emperors Claudius, Marcus Aurelius, Caracalla, and Geta, Saints Irenæus and Ambrose, Philibert de l'Orme, the Coustous, Jussieu, Suchet, Ampère, and Meissonier.

LYONS. Formerly a city in Clinton County, Iowa, annexed in 1895 to Clinton (q.v.).

LYONS. A city and the county-seat of Rice County, Kan., 183 miles west by south of Topeka; on the Missouri Pacific, the Saint Louis and San Francisco, and the Atchison, Topeka and Santa Fe railroads (Map: Kansas, D 3). It is an agricultural and stock-raising region, with valuable deposits of salt, and, besides large saltworks, has grain-elevators, a flour-mill, gas-engine works, etc. The water-works are owned and operated by the municipality. Population, in 1890, 1754; in 1900, 1736.

LYONS. A village and the county-seat of Wayne County, N. Y., 36 miles east by south of Rochester; on the Erie Canal and on the New York Central and Hudson River, the West Shore, and other railroads (Map: New York, C 2). It has numerous distilleries of peppermint oil, a large beet-sugar factory, a pottery, machine-shops, and manufactories of silverware, slipper-soles, barrels, and agricultural implements. Valuable water-power contributes to the industrial importance of the village. The Union School has a free library of about 3500 volumes. Lyons was laid out about 1795, and was incorporated as a village in 1854. Population, in 1890, 4475; in 1900, 4300.

LYONS, COUNCILS OF. The name applied to two synods received as ecumenical by the Roman Catholic Church. The first was held in 1245 by Innocent IV. (q.v.), largely for the purpose of discussing the questions at issue between the Pope and the Emperor Frederick II., who had driven the Pontiff from Rome. Innocent presided, and the patriarchs of Aquileia, Antioch, and Constantinople, the Emperor Baldwin II. of Constantinople, and representatives of several sovereigns were present. Definite provision was made for the support of the Latin Empire in the East, the relief of oppressed Christians in the Holy Land, and the defense of Christendom against the Mongol invaders. A solemn sentence of deposition was pronounced against Frederick II. on several grounds, in spite of a vigorous defense by his representative, Thaddæus of Suessa. The second Council of Lyons was convoked by Gregory X. immediately after his accession, and met in May, 1274. The Latin patriarchs of Antioch and Constantinople were present, and Saint Bonaventura was among the cardinals until his death in July, two days before the last session. The most important object aimed at was a reconciliation of the Eastern and Western Churches. This seemed to have been attained when representatives of the Greek bishops and Emperor acknowledged the primacy of the Roman See, the double procession of the Holy Ghost (see FILIOQUE), and the developed doctrine of purgatory. After a *Te Deum* of thanksgiving, the Pope intoned the creed in Latin, and the Greek deputies sang it in Greek, repeating twice the article "who proceedeth from the Father and the Son." The attempted reunion, however, soon proved illusory (see GREEK CHURCH), and no important service was rendered to the Christians of the Holy Land. Some disciplinary canons were passed, as well as regulations for Papal elections.

LYONS, GULF OF (Fr. *Golfe du Lion*). An arm of the Mediterranean, indenting the coast of France and extending from Cabo de Creus on the coast of Spain to the Iles d'Hyères, off the southern coast of France (Map: France, L 9). Navigation is hindered by numerous sand-bars. The coast as far as the estuary of the Rhone is sandy, and bordered with numerous lagoons. The portion east of Cape Couronne is steep and rocky. The chief towns on the Gulf are Marseilles, Toulon, and Cette. The Rhone empties into the Gulf.

LYONS, UNIVERSITY OF. One of the largest universities in France. It was organized in 1808, at the instance of Napoleon, as a part of the University of France, and up to 1895-96 was known as Facultés de Lyon. In 1902-03 it consisted of the faculties of law, medicine-pharmacy, mathematics-science, and philosophy. It had an attendance of over 2600 students, and a budget of about 290,000 francs. The Industrial School of Chemistry, the French School of Tanning, the Agronomic Station of the Rhone, the Central School of Lyons, the Veterinary School of Lyons, and the Catholic faculties of theology, law, mathematics-science, and philosophy, with an attendance of 600, constitute the annexes of the university.

LYONS, EDMUND, Lord LYONS (1790-1858). An English admiral and diplomat, born at Burton, Hampshire. He served in the East Indies, and especially distinguished himself by storming the Dutch fortifications at Marrack (1811). In 1828 he blockaded Navarino, and in 1833 carried King Otho to Athens from Triest. This service brought him an appointment as Minister at Athens. Upon the outbreak of the Crimean War he was appointed second in command of the Mediterranean fleet. He showed great skill and bravery in his attack on the sea defenses of Sebastopol. In 1855 he succeeded Dundas in chief command. He became vice-admiral and received temporary rank as admiral in 1857.

LYONS, Richard Bickerton Pemell, Lord Lyons (1817-87). An English diplomat. He was born in Lymington, Hampshire, England, and after a short service as a midshipman with his father, Admiral Lord Lyons, he was placed at school in Winchester, and later entered Christ Church College, Oxford, where he took his B.A. in 1838. Upon leaving college he entered at once the diplomatic service as attaché at Athens. There he remained until 1852, in which year he was transferred to Dresden, and in 1853 to Florence, where in 1856 he became secretary of the legation, and in 1858 envoy. In December, 1858, he was appointed British Minister to the United States, where he remained throughout nearly the whole period of the Civil War, resigning on account of ill health in February, 1865. This position, rendered exceedingly difficult by the strained relations between the governments of Great Britain and the United States, he maintained with dignity and great tact. In November, 1861, when called upon to present the demands of Great Britain for the release of Mason and Slidell (qq.v.), the Confederate Commissioners, his moderation and good sense, as much as any other one thing, averted the threatened conflict. In August, 1865, he was sent as British Ambassador to Constantinople, whence, in 1867, he was transferred in a similar capacity to Paris. He resigned his post at Paris in November, 1887, and died shortly afterwards. He was created first Earl Lyons in the year of his death.

LYRE (Fr. *lyre*, from Lat. *lyra*, from Gk. λύρα, lyre). A stringed musical instrument of the ancients, differing from the harp in having fewer strings and from the lute or guitar in having no keyboard. Two branching arms stretched upward from a hollow body, and they were joined by a cross-piece from which the strings were stretched to the bottom of the body. The strings were further supported by a cross-piece upon the body of the lyre. The shape of the body and the number of strings varied greatly, the strings being increased from three (the original number) to ten or twelve. Both the fingers and the plectrum seem to have been used in playing the lyre. As there was no keyboard, each string could give but one tone. The early history of the lyre is involved in considerable obscurity. It is probable that the lyre originated in Assyria, and that both Egypt and Greece derived their instrument from that country. It reached its most perfect form in Greece, but there is little real difference between the lyre, the Greek cithara and chelys, and the Jewish kinnor. The modern instrument most nearly akin to the lyre is the Nubian *kissar*, for an illustration of which see Cithara. For the importance of the lyre in the development of Greek musical theory, see Greek Music; and, for illustration, see Plate of Musical Instruments.

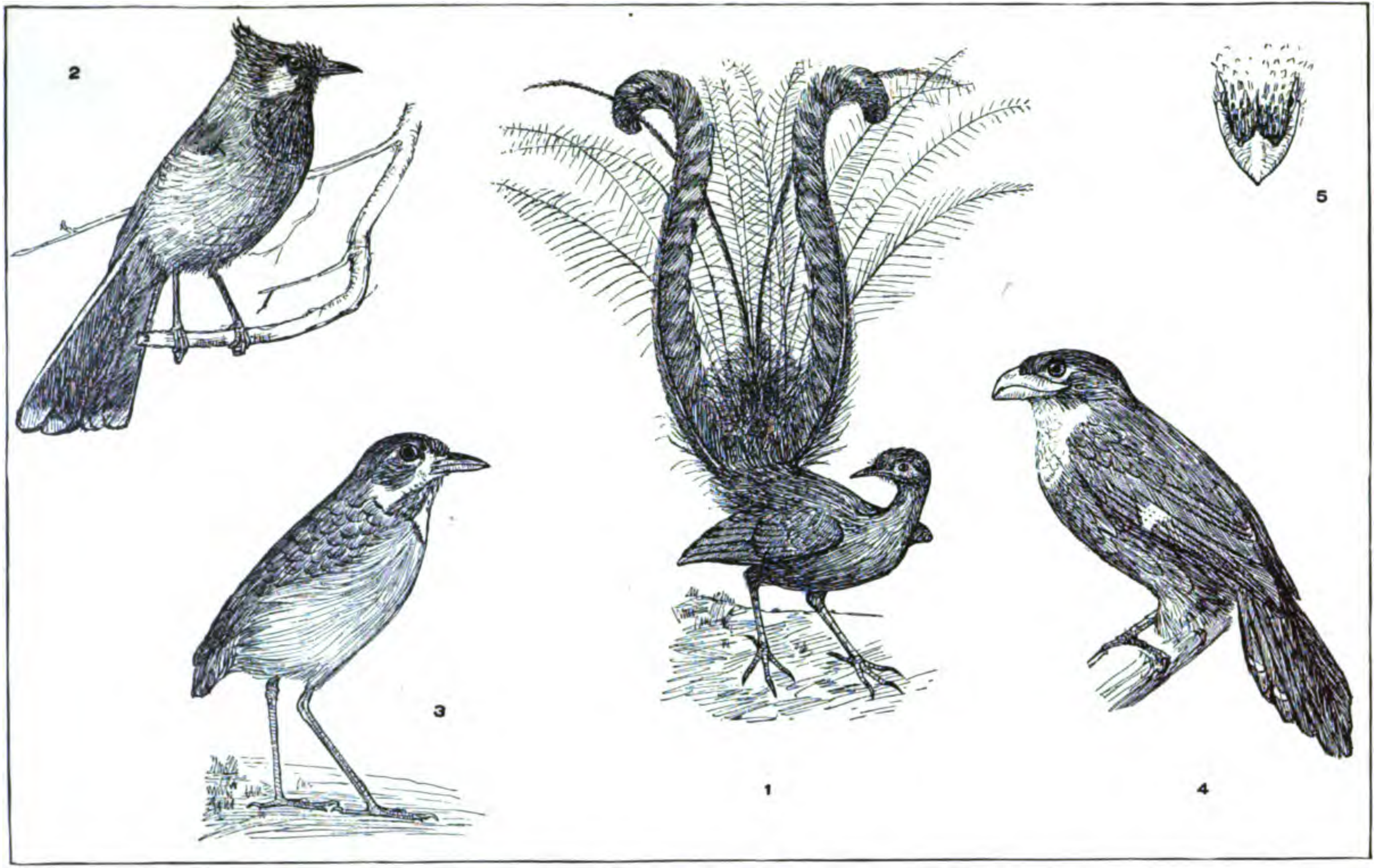
LYRE-BAT. A small bat (*Megaderma lyra*) of the family Nycteridæ. Huge ears are one of its characteristics. It is common in India and Ceylon, where it is known as 'vampire,' or more properly 'false vampire,' and is believed to have bloodsucking habits. It eats not only insects, but attacks smaller bats, frogs, and even small fish, first sucking their blood and then consuming the body. It is exceedingly abundant about old buildings, ruins, and caves, and swarms in the cave-temples. Many interesting particulars as to its habits are given in the works of Jerdon, Blyth, Blanford, and other East Indian zoologists. See Plate of Bats.

LYRE-BIRD. The lyre-birds (Menura) are among the most notable of Australian birds, not merely because of the remarkable tail, but because of certain points in the anatomy, which indicate their position among the lowest and least specialized forms of Passeres. These curious birds constitute a family by themselves, the Menuridæ, of which Menura is the only genus. They seem to be survivors of a very ancient and now almost extinct branch, whose nearest existing relatives are the Australian scrub-birds (Atrichiidæ). Two species are known, both inhabitants of Australia, but retreating before the advance of civilization, and becoming greatly reduced in numbers. They are found in the 'scrub' or sparsely wooded portions of unsettled country, are very shy, hard to approach, and difficult to flush. They are rapid runners and always seek to escape in that way. They are good singers and are said to be very capable mimics. In their feeding and other habits they resemble gallinaceous birds, and are commonly called 'pheasants' by the colonists. In size they approach the domestic fowl and the tail is about two feet in length (or height) when erected. The color is a sombre grayish brown, with more or less of a rufous cast. The sexes are alike in color, but the female has simply a long, wedge-shaped tail, while the tail of the cock consists of sixteen feathers, of which the two outermost are so curved as to form the outline of a lyre, and these have a wide inner vane; the two central feathers are very long and have a vane on one side only and that narrow; the vanes of the remaining twelve feathers are made up of widely separated barbs. This tail is not perfected until the bird has reached its fourth year, and in the semi-annual molt following the breeding season is shed to be renewed about six months later for the next nuptial season. In the best-known species (*Menura superba*) there is little rufous about the plumage, and the outer tail-feathers are long and marked with light bars, while in the second species (*Menura Alberti*) there is considerable rufous, and the outer tail-feathers are short and without bars. Their food consists of insects, snails, etc. The breeding habits of the lyre-birds are very remarkable, for they are said to build on the ground a large, well-woven, dome-shaped nest, with an entrance at one side, wherein the female deposits a single egg, which is very dark-colored, as though blotched over with ink. The males also scrape up mounds of earth, where they spend much time strutting about and displaying the tail. A full account, with many bibliographical references, will be found in Newton, *Dictionary of Birds* (London, 1893-96). See Plate of Lyre-Birds, etc.

LYREMAN. Any of the commoner cicadas, particularly the dog-day harvest-fly. See Cicada.

LYRIC POETRY (Lat. *lyricus*, from Gk. λυρικός, *lyrikos*, relating to the lyre, from λύρα, *lyra*, lyre). A name given by the Greeks to a kind of poetry chanted or sung to the accompaniment of a lyre. Though the lyric element

LYRE-BIRD, ETC.



1. LYRE-BIRD (Menura superba).
2. YELLOW-EARED BULBUL (Keloartia pencillata).
3. PROVOST'S ANT BIRD (Grallaria Guatemalensis).
4. DUSKY BROAD-BILL (Corydon Sumatranus).
5. BILL OF No. 4 from above.

is often apparent in epic, dramatic, didactic, or other literary forms, it is distinguishable from them. The lyric utters in the main only what is felt by the soul. It is a cry of the heart, sometimes joyful, but more often sad. In lyric poetry, description, narrative, psychic analysis, and drama have little or no place, for lyric poetry is emotional above all things. Therefore no true lyric can be of great length, for an emotion is soon spent or changed after a pause for recovery to an emotion of another kind.

The more objective and impersonal poetry is, the weaker does the lyric element become. On the other hand, despite strong personality, or seeming eccentricity, a lyric poet in uttering his individual emotions can hardly help expressing what is felt by other men, and thus the temperament of a race, its fears, regrets, yearnings, its sudden anger, its griefs and hopes, may find their outlet in lyric song. Though so complex and personal a thing is necessarily indefinable, we may think of the lyric as a musical expression of emotions by language. If meant to be heard with music the lyric necessarily follows a beat or measure answering more or less to those of the instrument to whose music it is sung. Thus in antiquity lyric song was adapted to the lyre or harp. Mediæval singers used other instruments, such as the rebeck, viol, bagpipe, and lute. The lute was a favorite instrument in Shakespeare's time. The very barbers kept lutes in order that a waiting customer might while away his time with a lyric song. How much more lyric than we the Elizabethans were, is likewise proved by the fact that in playing Shakespeare we nowadays are robbed of the lyric passages, which managers cut out on the ground that they clog or delay the plot. By Elizabethan audiences the lyrics were relished like the other elements.

Lyric poetry has usually been strongest and best among those races and at those times wherein individuality has manifested itself most potently. Thus it burst out in Greece when the monarchies were yielding to oligarchy and democracy. From the eighth century B.C. to the middle of the fifth a throng of poets were singing in Asia Minor, on the Greek mainland, and amid the isles of the Ionian Sea. Callinus of Ephesus, the creator of the Greek political elegy; Tyrtæus, maker of those elegies which inspired the Spartans as they marched to battle; Mimnermus, composer of erotic elegies, with Solon, Theognis, and Phocylides; Archilochus, Hipponax, and Simonides of Amorgos in the iambic; Anacreon, Alcæus, and Sappho in the love song; and finally Pindar and others in choral poetry, are all representatives of the Greek lyric.

In Italy, Horace, Catullus, Tibullus, Propertius, and Ovid put their personal emotions into verse, but lyric poetry never throve among the Romans, whose individuality was hampered by the State, nor were they a highly emotional people. Nevertheless the Roman soldiery sang satirical verses as they followed the triumphal chariot of a conqueror; the Romans have left us also a few bits in rhythmic septenarius verse, and their popular songs were probably imitated in the Latin hymns of the Church. For centuries lyric poetry seems to have been kept alive by the lower classes. About 1050 it began to bloom in Provence, whence it spread to Northern France, Sicily, then to Umbria and Tuscany. Or, perhaps it were better to say that it began spontaneously to flourish in these regions, although it was influenced in its growth by the poetry of the Troubadours. In Umbria Jacopone uttered the emotions of a religious upheaval; in Tuscany Lapo Gianni, Guido Cavalcanti, Cino da Pistoja, and Dante and Petrarch began to sing.

In Northern France Adam de la Halle, Gautier de Coincy, Colin Muset, Conon de Béthune, and others composed lyric poems, but François Villon (q.v.) was the first Frenchman to put himself, soul and body, into poesy. The lyrico-epic songs, called in the Middle Ages *chansons d'histoire* or *chansons de toile*, with *motets, rotrouenges, rondeaux, ballettes, estampies, virelis*, were well-known northern forms. The *serventois* was also Provençal. The *chanson* properly so called came from the south with the *salut d'amour*, the *tençon*, and the *jeux partis*. After languishing for three hundred years, French lyric poetry began to revive in the prose of Rousseau and reached its height in Victor Hugo.

The French *ballade, rondeau, triolet*, and *villanelle* (Ital. *villanella*) are well known from such English imitations as Austin Dobson's. English poetry before the Norman Conquest was largely narrative, though it was often lyrical in the depth of its emotion. *Deor's Complaint* is the earliest lyric known in Anglo-Saxon. Purely lyric poems appeared in the fourteenth century, a century after Walther von der Vogelweide's patriotic songs and love poems had charmed Germany. To the fourteenth century belong several pretty love poems, beautiful hymns to the Virgin, *ballades, rondels, virelays*, and a series of political songs by Laurence Minot celebrating the exploits of Edward III. In Elizabethan days the lyric assumed the form of the song, the pastoral, the madrigal, and the sonnet. These spontaneous lyrics were succeeded by the love songs of the Cavaliers and the classic lyrics of Milton. After Milton lyric poetry in England was choked by the critics, who were swayed by French influence. France had scarcely had any lyric poetry since the Pléiade and Maturin de Régnier. Then came Gray, Collins, Chatterton, and the more spontaneous Burns. Throughout the nineteenth century English poetry was mainly lyrical in temper and much of it was so in form. We are still and perhaps we shall always be in doubt as to how lyric poetry arose and where, but the documents of literature allow us to follow the development of lyric poetry from long before Christ to now. Never had the lyric wider sway than in the nineteenth century. True, much, indeed most, of the lyrics of Goethe and of Heine, of Lamartine and Hugo, of Wordsworth, Keats, Shelley, and Byron, and later of Tennyson, Browning, and Swinburne, are not songs and were never meant to be sung; on the other hand, they hold the emotions of an immensely complex world.

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(Paris, 1895); Gorra, *Delle origini della poesia lirica del medio evo* (Turin, 1895); Symonds, *Wine, Woman, and Song* (London, 1884-99), excellent translations of the Latin songs of mediæval students with a preface on Goliardic literature; Werner, *Lyriker und Epiker* (Leipzig, 1890); Carpenter, *Outline Guide to the Study of English Lyric Poetry* (Chicago, 1897), which contains a rich bibliography; and, for selections, Palgrave, *Golden Treasury of Songs and Lyrics* (1st series, London, 1861, enlarged 1891; 2d series, 1897); Ward, *English Cantos* (4 vols., London, 1880-83). Consult also Canfield, *French Lyrics*, selections from the earliest down to the latest lyric poets (New York, 1899), and Quiller-Couch, *The Golden Pomp, English Lyrics from Surrey to Shirley* (London, 1902).

LYS, lês, or **LEYE**, lī'*e*. A tributary of the Scheldt. It rises in France in the Department of Pas-de-Calais, and flows in a northeast direction, forming for a part of its course the boundary between France and Belgium and joining the Scheldt at Ghent, after a course of 130 miles (Map: Belgium, B 4). It is canalized for 44 miles from the town of Aire, near its source, to the Belgian frontier, and connects with an extensive canal system through which some of its water flows into the North Sea at Ostend.

LYSAN'DER (Lat., from Gk. *Λύσανδρος*, *Lysandros*) (?-B.C. 395). A Spartan general, son of Aristoclitus. Born of an impoverished family, by energy and force of character he worked his way to the front. In B.C. 407 he was appointed to the command of the Spartan fleet, and defeated the Athenians near the promontory of Notium. When his year of office had expired he was succeeded by Callicratidas, who was defeated in B.C. 406 at Arginusæ. In the following year Lysander was again put in virtual command; but, that the rule might be preserved which prescribed that no one should be *nauarchus* twice, he had, as a nominal superior, an officer named Aracus. In the same year he overwhelmed the Athenian fleet at Ægospotami, and afterwards sailed to Athens; the city surrendered in the spring of B.C. 404, and the Peloponnesian War was thus brought to an end. Lysander was now the most powerful man in Greece, but his pride, arrogance, and vanity were unbounded. The Spartan ephors finally found it necessary to depose him from his command and call him home to answer to charges of insubordination. He escaped answering to the charges, and in B.C. 395 he was sent in command of an army against the Bœotians, and was killed in the battle of Haliartus. It is said that he was at the time laying plans to overthrow the reigning dynasty at Sparta. Lysander was an able and courageous general, but his ambition was wholly personal, and he was thoroughly unscrupulous.

LYSIAS, lĭsh'ĭ-*as* (Lat., from Gk. *Λυσίας*) (c.450-380 B.C.). The third in point of time of the ten Attic orators of the Canon Alexandrinus (q.v.). His father was Cephalus, a wealthy Syracusan, who was induced by Pericles to move to Athens, where he became a resident alien, the friend of Socrates and other eminent Athenians. The scene of Plato's *Republic* is laid at his house. At the age of fifteen Lysias with his brother Polemarchus went to the Athenian colony of Thurii in Southern Italy. There he studied rhetoric, probably under Tisias. In B.C. 412, when the failure of the Sicilian expedition of the Athenians had given the anti-Athenian party supremacy in Thurii, Lysias returned to Athens, where with his brother he carried on a large shield manufacturing business. During the distracted period under the rule of the Thirty (B.C. 404-403; see THIRTY TYRANTS), the brothers' large possessions excited the rapacity of the governing body; their house was attacked by armed men while Lysias was entertaining some friends, their property seized, and Polemarchus put to death; Lysias, however, by bribing the soldiers who had him in ward, escaped to Megara. From Megara he assisted Thrasybulus in freeing Athens of the tyrants, and came back in 403 when the democrats gained the upper hand.

On his return he prosecuted Eratosthenes, one of the Thirty, as his brother's murderer, in a speech still extant, but the result of the prosecution is unknown. Lysias now entered on the business of logographer, a writer of speeches for others to deliver, in which he attained great success. Of the 34 (35) extant orations only the oration *Against Eratosthenes* was spoken by Lysias himself. In all the rest there is an extraordinary adaptation to the peculiar conditions and characters of the speakers, the value of which before a jury Lysias was the first logographer to appreciate. His native 'plain style,' which the ancients praised, was no doubt fostered by the simple character of his clients. The chief excellences noted by Dionysius are his purity in diction, brevity, clearness, simplicity, vividness, propriety, and charm. Everywhere his consummate art conceals the art with which the speeches were composed. In antiquity 425 speeches were attributed to him; the rhetoricians of Augustus's day regarded 233 of these genuine; we know the titles of but 172. Only 31 have been preserved entire; of three more, large fragments are quoted by Dionysius; and there is found in Plato's *Phædrus* a speech on "Love." There are besides only a few scanty fragments. Lysias's literary activity ended with B.C. 380, and he probably died soon after. The best modern editions are by Bekker (Berlin, 1823); Baiter and Sauppe (Zurich, 1839-43); Scheibe (Leipzig, 1835); Cobet (Amsterdam, 1863); Thalheim (Leipzig, 1901). Selected orations, with English notes by Stevens (Chicago, 1876); Schuckburgh (4th ed. London, 1890); Bristol (Boston, 1892); Morgan (Boston, 1895); Wait (New York, 1898). There is a poor English translation by Gillies. Consult: Blass, *Attische Beredsamkeit*, vol. i., pp. 338-644 (Leipzig, 1887); and Jebb, *Attic Orators*, vol. i., pp. 142-312 (1880).

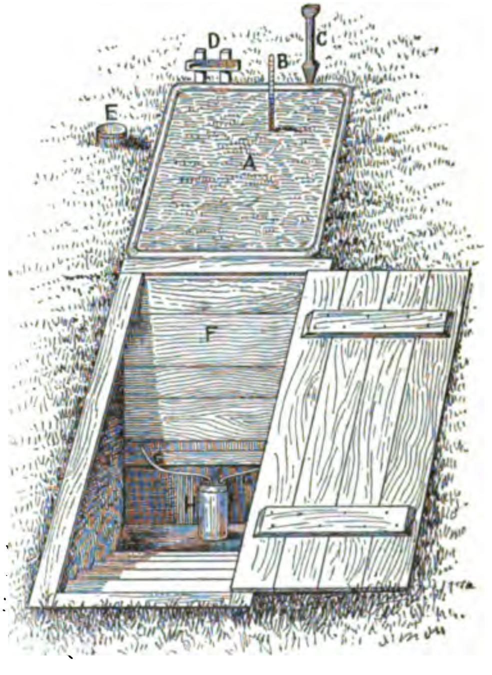
LYS'IAS. Regent of Syria under Antiochus Epiphanes, and noted for the wars he carried on against the Jews. His great army was defeated by Judas Maccabæus near Emmaus, B.C. 166. In the following year he was repulsed near Bethsura, but captured that fortress B.C. 163, and besieged Jerusalem. He was compelled to withdraw by an insurrection at Antioch, and shortly after was murdered by the populace.

LYSIC'RATES (Lat., from Gk. *Λυσικράτης*, *Lysikratēs*), CHORAGIC MONUMENT OF. A beautiful monument in Athens, in the form of a round temple, and one of the earliest examples of Corinthian architecture. It was dedicated to Dionysus B.C. 334, by Lysicrates, as winner in the Dionysiac Games, and was surmounted by the bronze tripod which was the usual prize in that contest. The monument, which is the only surviving one of a large number of similar structures which lined the ancient street of Tripods, stands on a cubical base 13 feet high. The surface of the circular temple of pentelic marble, 9 feet in circumference and 21½ feet high, is divided by six Corinthian half-columns into carved panels, and the upper portion is surrounded by a band decorated with tripods in relief. The roof is formed of a single block of marble, carved in a leaf pattern, and is provided with acanthus supports, on which the tripod rested. The frieze, about 10½ inches high, represents the punishment by Dionysus of the Tyrrhenian pirates, who are being beaten by satyrs and changed into dolphins. The building, because of its shape, was popularly known as the 'Lantern of Demosthenes.'

LYSIMACHIA, lī'sĭ-măk'ĭ-ȧ (Lat., from Gk. *λυσιμάχιον*, *lysimachion*, a medicinal herb, supposed to be named in honor of *Λυσίμαχος*, *Lysimachos*, Lysimachus, a king of Thrace, but more probably from *λυσίμαχος*, loosing strife, from *λύειν*, *lyein*, to loose + *μάχη*, *machē*, strife), or LOOSESTRIFE. A genus of plants of the natural order Primulaceæ, or primrose family. They are leafy, stemmed perennials, generally with yellow flowers, axillary, or in a terminal raceme. Species grow in nearly all parts of the world, several in the United States, some being cultivated in gardens, as the moneywort (*Lysimachia Nummularia*), which was introduced from Europe. In this the leaves are roundish, small, with short petioles; peduncles axillary, one-flowered, ovate, acute sepals. It is a beautiful plant for hanging baskets and for covering rocks, and also for carpeting beneath shrubs, forming, as it does, a thick mat. In some places it has escaped from the gardens into damp ground. It blooms from July to September. There are three indigenous and one introduced species enumerated by Gray as occurring in the United States: *Lysimachia thyrsiflora*, or tufted loosestrife, found in swamps from Pennsylvania northward, blooms in June and July; *Lysimachia stricta*, in low grounds, blooming from June to August; *Lysimachia quadrifolia*, a common plant in the Middle States, growing in moist or sandy soil, blooming in June; and *Lysimachia Nummularia*, noticed above. *Lysimachia vulgaris*, the yellow loosestrife of Europe, is occasionally found escaped from gardens in the Eastern United States. *Lysimachia punctata* and *Lysimachia clethroides*, the latter from Japan, are grown in gardens for their flowers, those of the latter being white. Various species of Steironema were formerly referred to this genus.

LYSIM'ACHUS (Lat., from Gk. *Λυσίμαχος*) (c.360-281 B.C.). A general in the army of Alexander the Great. He was born at Pella, Macedonia, and in his youth was distinguished for bravery and physical strength. When the Empire of Alexander was divided at his death (B.C. 323) Lysimachus received Thrace, of which he took possession after conquering Seuthes, the King of the country. In B.C. 314 he joined the league formed against Antigonus by Ptolemy, Seleucus, and Cassander. In B.C. 306 he took the title of King. Together with Seleucus he overwhelmed Antigonus and Demetrius Poliorcetes in the battle of Ipsus (B.C. 301 or 300), and thereupon appropriated the northwest part of Asia Minor. Nine years later he attacked the Getæ, north of the Danube, but was defeated and taken prisoner, and was released only on marrying his daughter to the King of the Getæ. In B.C. 288 he combined with Ptolemy, Seleucus, and Pyrrhus against Demetrius. The last part of the life of Lysimachus was imbittered by domestic troubles. After he had put to death his son Agathocles at the instigation of his wife Arsinoë, the people of Asia Minor rose in rebellion, and, being assisted by Seleucus, defeated and killed him in the battle of Corupedion.

LYSIMETER, lī-sĭm'ė-tẽr (from Gk. *λύσις*, *lysis*, a dissolving + *μέτρον*, *metron*, measure), or DRAIN-GAUGE. A device for collecting and measuring the water (rain) percolating through soils. It is essentially a water-tight box or cylinder of definite content, as a cubic yard or meter, or inclosing a definite area, as $\frac{1}{1000}$ or $\frac{1}{5000}$ acre, to a given depth, sunk into the soil to a level with its top, and provided with a bottom so arranged that the percolating water may be drawn off and collected in a suitable receiver for measurement and examination. In some cases the boxes are placed in pits dug to receive them and filled with the soil removed from the pits. Generally the purpose, however, is to maintain the conditions in the lysimeter as nearly like those in the natural soil outside as possible, and in this case the lysimeter box or cylinder is forced into the soil, and its bottom adjusted without disturbing the inclosed soil, or the box is built around an undisturbed block of soil. The most notable work with lysimeters has been done by Lawes, Gilbert, and Warington at Rothamsted, England; by Dehérain at Grignon, France; and in this country by Stockbridge at the Agricul-



STOCKBRIDGE LYSIMETER.

A, Soil in lysimeter; B, soil-thermometer; C, air-thermometer; D, air-thermometer; E, rain-gauge; F, front of lysimeter; G, rubber pipes to conduct water from tubes to jar; H, water-jar.

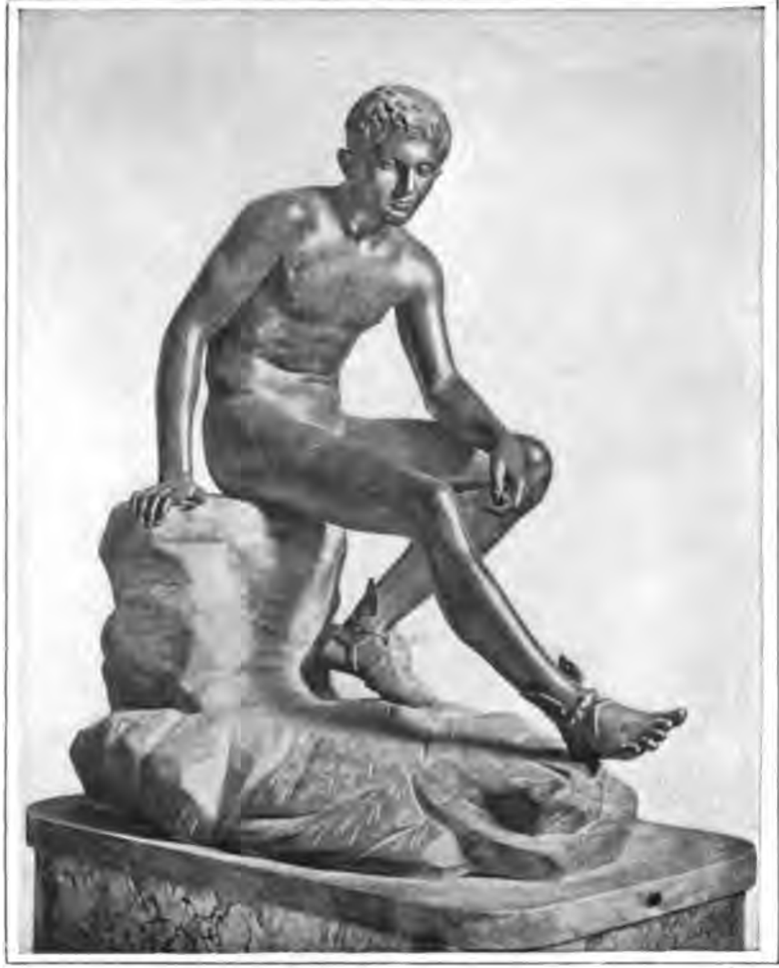
tural College, Amherst, Mass., and Sturtevant, Babcock, and Goff at the Agricultural Experiment Station, Geneva, N. Y. The Rothamsted drain-gauges were constructed by digging a trench in the soil, gradually undermining the soil at the desired depth, and putting in perforated iron plates to support the mass. The plates were kept in place by iron girders, the ends of the plates and the girders being supported by brick-work. Trenches were then dug around the blocks of soil and these were inclosed in walls of brick laid in cement. A zinc funnel of the same area as the block of soil was fixed to the perforated iron bottom to collect the drainage water and conduct it into a suitable receptacle. The gauges were $\frac{1}{1000}$ acre in area, and 24.40 and 60 inches deep in different cases. A lysimeter three feet deep and inclosing an area of $\frac{1}{3000}$ acre, constructed by Stockbridge at Amherst, is shown in the figure. Observations with the lysimeters at Rothamsted during twenty years showed that on the average slightly less than one-half of the rainfall escaped in the drainage of bare soils, the proportion varying slightly with the different depths. In observations made by Klucharov at Moscow, Russia, on bare soils inclosed in metal cylinders driven into the soil, approximately one-fourth of the rainfall percolated through a depth of 20 cm. of soil. With soils covered with plants the percolation was much less. Stockbridge found that about one-fifth of the rainfall percolated through a bare drift soil three feet deep. Sturtevant concluded from observations made at Geneva that lysimeters as ordinarily constructed do not give results applicable to soils in their natural condition, mainly because the soil in the lysimeter is not in connection with a permanent water-table. He attempted to overcome this objection by constructing a lysimeter provided with an artificial water-table. With such a lysimeter the drainage was approximately 37 per cent. of the rainfall under sod, 41 per cent. with bare soil, and 43 per cent. with soil cultivated three inches deep. While it is doubtful whether lysimeters even with the greatest care in their construction and management give results representing accurately the conditions actually obtaining in natural soils, they have proved valuable for comparative scientific studies, not only on percolation, but on the losses of soil constituents in drainage and on the process of nitrification (q.v.) in soils. For further information on the subject, consult: Gilbert, "Observations on Rainfall, Percolation, and Evaporation," in *Rothamsted Memoirs*, vol. vii. (London, 1890); Stockbridge, *Investigations in Rainfall, Percolation, and Evaporation* (Boston, 1879); New York State Experiment Station Reports, 1882, 1887, 1888, 1890; Dehérain, "Les eaux de drainage des terres cultivés," in *Annales Agronomiques*, vol. xix. (Paris, 1893).

LYSIP′PUS (Lat., from Gk. *Λύσιππος*). A celebrated Greek sculptor. A native of Sicyon, in the Peloponnesus, he was at first a worker in bronze, and then applied himself to statuary, becoming the head of the Sicyonian school, and the founder of a new style, which was at the basis of a large part of the sculpture of the Hellenistic age. The dates of his birth and death are not known, but he was an older contemporary of Alexander the Great, whom he long survived. His artistic activity thus falls in the last part of the fourth century. He claimed to have had no master, but to have learned his art from the famous Doryphorus as Canon of Polyclitus. In fact, he seems to have taken that work as his starting-point, and developed a new system of proportions in which he united many of the characteristics of the Attic and Peloponnesian schools. His statues were marked by a small head, long legs, slender figure, and fine naturalism in the treatment of the hair. His pupil Xenocrates, whose treatise on art aimed to exalt his master as the culmination of Greek art, claimed that he was the first to represent men as they really were. Such statues are numerous in the marble copies of our museums, and many have been brought into connection with Lysippus. The most celebrated is the Apoxyomenos of the Vatican, which represents a young athlete using the strigil, or scraper, after the bath. Another undoubted copy is the marble group of Daochos the Thessalian and his ancestors, discovered at Delphi, which must reproduce the bronzes of Lysippus at Pharsalia. His portraits of Alexander were celebrated, and he was said to be the only artist in bronze to whom the King would sit. It seems probable that the bust of Alexander in the Louvre and perhaps the bronze mounted Alexander from Pompeii are based on Lysippean originals. He is said to have produced 1500 statues, all in bronze, and to have given special attention to the technical details of the casting. He executed the equestrian statues of twenty-five Macedonians who fell at the passage of the Granicus, which Metellus transported to Rome; a fine bronze statue of Cupid, with a bow; several statues of Jupiter, one of which, 60 feet high, was at Tarentum; one of Hercules, which was removed to Rome; the Sun-god, drawn in a chariot by four horses; "Opportunity" (Kairos), represented as a youth with wings on his ankles on the point of flying from the earth. Of these we have no certain traces, unless, as is not improbable, a standing Hercules in the Pitti Palace is derived from this source. The same type distorted into the over-developed athlete appears in the later well-known Farnese Hercules by Glycon. To him or his immediate followers may also be attributed the Silenus holding the infant Dionysus, of which there are several extant copies, and the seated Hermes in bronze from Herculaneum.

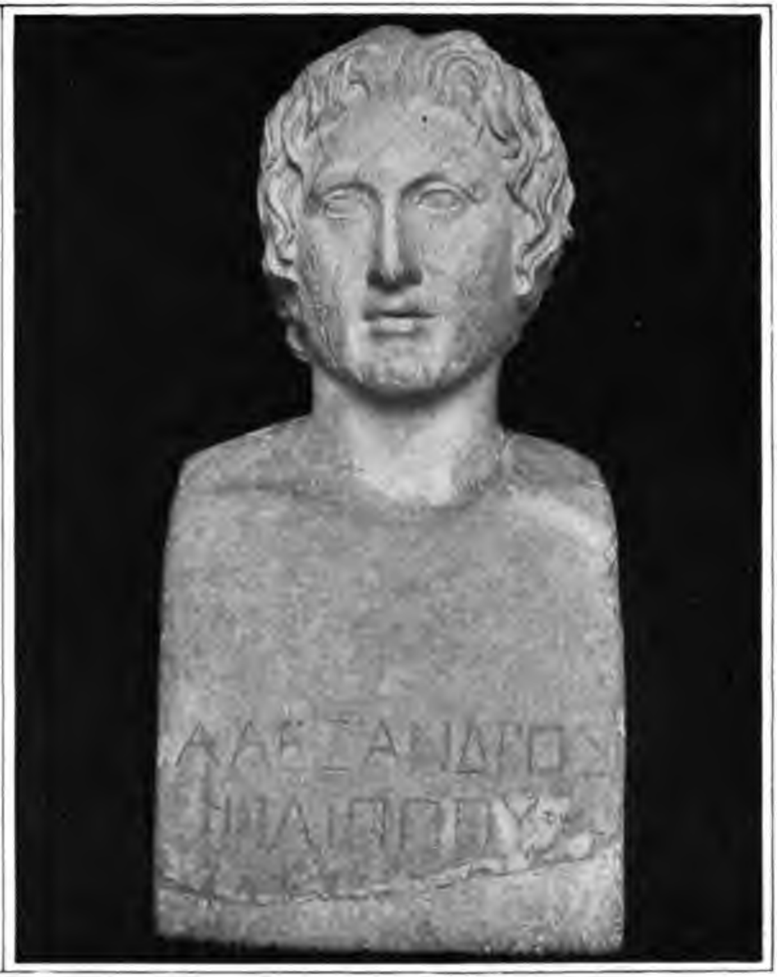
LYSKANDER, lụ-skän′dẽr, CLAUS CHRISTOFFERSEN (1558-1623). A Danish historian, born in Skaane. He studied theology at Rostock, and lived nearly all his life as pastor at Herfoelge. Besides Latin poems, he wrote some rhymed chronicles: *Danske Kongers Slægtebog* (1622), intended as a preface to a History of Denmark which he planned to write; and *De Scriptoribus Danicis*, which appeared in the *Monumenta Inedita Rerum Germanicarum* (1753), and is a list of all Danish writers up to his time. Consult Rördam, *Lyskanders Levned* (Copenhagen, 1868).

LYSOL (from Gk. *λύσειν*, *lysein*, fut. of *λύειν*, *lyein*, to loose). A brown, oily, clear liquid with an odor resembling creosote but less pronounced. It is prepared from tar oil by saponification, and contains about 50 per cent. of cresols. It is soluble in water, alcohol, chloroform, glycerin, and benzine. With water it forms a clear, frothy, soapy liquid. This property is a disadvantage in surgical work requiring the use of instruments, as it renders them somewhat slip-

LYSIPPUS



HERMES RESTING, Bronze in National Museum, Naples. School of Lysippus.



ALEXANDER THE GREAT, from the Original in the Louvre, Paris. Attributed to Lysippus.

pery. For purposes where a lubricant is desired it is a useful antiseptic for the hands in a 1 to 2 per cent. solution. Its chief value is found in obstetrical work.

LYSONS, lī′sonz, Daniel (1762-1834). An English topographer and antiquary. He graduated at Saint Mary's Hall, took orders, was appointed curate of Mortlake in 1784, and in 1790 curate of Putney, Surrey. He is best known for his *Environs of London* (4 vols., 1792-96), undertaken through the encouragement of Horace Walpole, to whom it was dedicated. He also began the preparation of a work entitled *Magna Britannia, being a Concise Topographical Account of the Several Counties of Great Britain* (1806-22), of which only six volumes were published. His further publications include *Select Psalms* (1799) and *A View of the Revenues of the Parochial Clergy of This Kingdom* (1824).

LYSONS, Samuel (1763-1819). An English antiquary, brother of Daniel Lysons (q.v.), born at Rodmarton. Although educated for the bar, he relinquished the law for antiquarian pursuits. He was made Keeper of the Records of the Tower of London in 1803, and of the Society of Antiquaries in 1812. He published *Roman Antiquities Discovered at Woodchester* (1797), and *Reliquiæ Britannico-Romanæ* (1801-17). He wrote also for the *Archæologia*, and assisted his brother Daniel in the preparation of the *Magna Britannia* in 1806-22.

LYSSA, LYSSOPHOBIA. See Hydrophobia.

LYSTRA, lĭs′trȧ (Lat., from Gk. *Λύστρα*). A city of Lycaonia, in Asia Minor. It is worthy of note in sacred history as the birthplace of Timothy, and the place where Paul had divine honors offered him and soon after was stoned (Acts xiv. 6-20). It was in the western part of the great plain of Lycaonia, eight hours from Iconium, the modern Konieh (q.v.), and is now known as Khatūn Serai, as was discovered by an American exploring party in 1886. Some had sought to identify it with the ruins of Bin-bir-Kilisseh.

LYTE, Henry Francis (1793-1847). A Scottish hymn-writer, born at Ednam, near Kelso. He graduated from Trinity College, Dublin, where he became scholar (1813), took orders, and was a curate for twenty-five years at Brixham, Devonshire. Lyte died at Nice, November 20, 1847. He was the author of many favorite hymns, as "Jesus, I my cross have taken," and "Abide with me, fast falls the eventide." His *Miscellaneous Poems* were published with a memoir by his daughter (London, 1868).

LYTHRA′CEÆ (Neo-Lat. nom. pl., from *Lythrum*, from Gk. *λύθρον*, *lythron*, gore), The Loosestrife Family. A natural order of dicotyledonous herbs and a few shrubs, with frequently four-cornered branches, generally opposite entire and sessile leaves, solitary or clustered, regular or irregular flowers, either axillary, racemose, or in spikes; tubular calyx, into which the very deciduous petals, when present, are inserted. The stamens are inserted into the tube of the calyx below the petals, sometimes equal to them in number, sometimes two or three times as many. The generally two to six celled superior ovary ripens into a membranous capsule with numerous seeds. There are about 360 known species, embraced in 20 genera, natives of tropical and temperate or even of cold climates. The henna (q.v.) of Egypt is produced by *Lawsonia alba*, a plant of this order. The leaves of another (*Pemphis acidula*) are said to be a common pot-herb on the coasts of the tropical parts of Asia. The leaves of *Ammania baccifera*, an East Indian aquatic plant, are very acrid and are sometimes used as blisters. The principal genera are Peplis, Lythrum, Cuphea, and Lagerstrœmia. By Bentham and Hooker the pomegranate (*Punica Granatum*) is included in this order, while Engler makes the genus the type of a separate order Punicaceæ. See Pomegranate.

LYTHRUM (Neo-Lat., from Gk. *λύθρον*, *lythron*, gore; so called from the crimson or purple color of the flowers). A genus of herbaceous plants, called also loosestrife in common with Lysimachia (q.v.), although belonging to another order, Primulaceæ. The herb is slender, with opposite or scattered, mostly sessile leaves, and large purple flowers. The *Lythrum Salicaria*, or spiked loosestrife, is a European perennial, but is found in wet meadows, particularly in New England and eastern New York, where it is frequently cultivated; leaves lanceolate, heart-shaped at the base, sometimes whorled in threes; stamens 12—twice the number of petals—6 long and 6 short. It is a fine, tall, rather downy plant, with large flowers, from crimson to purple. By growing in dry places the plant becomes more downy and hoary, and considerably dwarfed. It has a mucilaginous, astringent taste. The blackish-brown, branching, and fibrous root is also astringent, mucilage and tannin being its principal constituents. It is mentioned in some pharmacopœias. The principal species indigenous to the United States are *Lythrum Hyssopifolia*, a low annual, from 6 to 10 inches high, the petals pale purple, found in marshes on the coast of New England and New Jersey. *Lythrum alatum*, a tall and wand-like perennial, with leaves from oblong-ovate to lanceolate, and deep purple flowers, grows from Michigan and Wisconsin southward. *Lythrum lineare*, a slender species, from 3 to 4 feet tall, bushy at the top, with short, linear, chiefly opposite leaves, whitish petals, grows in brackish marshes in New Jersey and southward. Under cultivation these plants improve greatly, and a number of kinds are offered by florists. They are of easy cultivation, growing readily and flowering freely in moist soil.

LYTLE, lĭt′l, William Haines (1826-63). An American soldier and poet. He was born in Cincinnati, Ohio, graduated at Cincinnati College, studied law and began practice, but, having soldierly antecedents, he volunteered for the Mexican War, was chosen captain of the Second Ohio Regiment, and soon after the war was elected to the State Legislature. Before the Civil War he had become major-general of militia, and in 1861 was commissioned colonel of the Tenth Ohio. He was severely wounded in September, 1861, and soon after resuming active service was again wounded and taken prisoner October 8, 1862, but was soon exchanged and made brigadier-general of volunteers, November 29, 1862. He was then actively engaged with the Army of the West till he was killed leading a charge of his brigade at Chickamauga. Lytle is also well remembered through his poem, *Address of Antony to Cleopatra*, beginning "I am dying, Egypt, dying; ebbs the crimson life-tide fast." His *Poems* were edited with *Memoir* by Venable (Cincinnati, 1884).

LYTTELTON, lĭt″l-t*o*n. A seaport of South Island, New Zealand, on Port Lyttelton, in the Province of Canterbury, five miles southeast of Christchurch (q.v.) (Map: New Zealand, D 5). It has extensive harbor accommodations, and is the outlet for the exports of the region. Population, in 1901, 4023.

LYTTELTON, Edward, Lord Lyttelton (1589-1645). An English jurist, born at Munslow, Shropshire. He graduated at Oxford in 1609, and was appointed Chief Justice of North Wales in 1621. In 1626 he was elected to Parliament, in 1631 was appointed Recorder of London, and in 1634 was made Solicitor-General. He was successfully advanced by the King to be Chief Justice of Common Pleas in 1640, Lord Keeper of the Great Seal in 1641, and a peer in the same year. In 1642 he escaped with the Great Seal to Charles I. at York, in 1643 was required by Parliament to restore it on pain of losing his place, and in 1644 was appointed First Commissioner of the Treasury. He was vacillating in character, and frequently incurred the distrust of both Parliamentarians and Royalists.

LYTTELTON, George, first Baron Lyttelton (1709-73). An English statesman and author. He was educated at Eton and Christ Church, Oxford, entered Parliament in 1730, held several high political offices, and distinguished himself in debate. Lyttelton was a friend of Pope and other literary men, and himself had once a considerable reputation as an author. Among his works are: *Observations on the Conversion and Apostleship of Saint Paul* (1747), a treatise on Christian evidences; *Dialogues of the Dead* (1760); and a *History of Henry II.* (1764-67), a work of great research, but now superseded. His verse, inferior to his prose, was chiefly included in *Poetical Works* (1785).

LYTTELTON, George William, fourth Baron Lyttelton (1817-76). An English statesman and scholar, born in London. He was educated at Eton and Trinity College, Cambridge. He was Under-Secretary of State in 1846, and later chairman of the Canterbury Association, which sent Church of England colonists to New Zealand; was principal of Queen's College, Birmingham, first president of the Birmingham and Midland Institute, a founder of the Saltby Training-School, a member of the Public Schools Inquiry Commission (1861), and Chief Commissioner of Endowed Schools (1869). He and Gladstone married, on the same day, the sisters Mary and Catherine Glynn. He wrote *Ephemera* (1864-72). Consult Gladstone, *Brief Memorials of Lord Lyttelton* (London, 1876).

LYTTELTON, Sir Thomas. See Littleton, Sir Thomas.

LYTTELTON, Thomas, second Baron Lyttelton (1744-79). An English politician, known as the "Wicked Lord Lyttelton," son of Baron George Lyttelton. He was born at Hagley, and was educated at Eton and at Christ Church, Oxford. In 1768 he was elected to Parliament, but almost immediately unseated on petition. In 1773 he took his seat in the House of Lords, after his father's death, and gained some reputation by his speeches. He is mentioned, for his viciousness, in Combe's *Diaboliad.* Because of his general views in politics and his vigorous style, and on account of the fact that he was unseated from Commons just before the first of the *Letters*, it has been argued that Lyttelton was the author of the *Letters of Junius.* Consult the *Quarterly Review*, vol. xc. (London, 1852).

LYT'TON, Edward George Earle Lytton Bulwer. See Bulwer-Lytton, Edward.

LYTTON, Edward Robert Bulwer (1831-91). A poet and statesman, only son of the novelist Bulwer-Lytton (q.v.) and best known under his pseudonym Owen Meredith. He was born in London, November 8, 1831. He was educated at Harrow and at Bonn, where he devoted himself to modern languages. After long service as diplomatist at Washington, where he was private secretary to his uncle, Lord Dalling (1849), at Florence, Paris, The Hague, Madrid, Vienna (1868-72), Constantinople, Lisbon, and other places, he was appointed by Lord Beaconsfield to be Viceroy of India (1876). The memorable events of his administration were the proclamation of the Queen as Empress of India, the great famine, and the Afghan War. A man of immense energy and resources, he inaugurated many internal reforms in the Government of India. In 1880 he resigned and returned to England. His administration of India was harshly criticised. He was even accused of being a puppet of Downing Street. Time, however, wrought a change. His political opponents came to admire him. On the death of his father (1873) he became Baron Lytton, and in 1880 was made Earl of Lytton. In 1883 he published the first two volumes of a biography of his father. This biography, unfortunately, breaks off with the year 1832. The son would have been put to a severe test had he candidly followed his father's career from 1832 on. From 1887 till his death, November 24, 1891, he was British Ambassador at Paris. Among his many volumes of verse are: *Clytemnestra* (1855); *The Wanderer* (1857), containing his best lyrics; *Lucile* (1860), a very popular novel in verse, avowedly borrowed in part from George Sand's *Lavinia. Lucile* is in rhyming anapæstic couplets, and therefore an interesting experiment in English literary history. Lytton himself rather disapproved of *Lucile. Tannhäuser*, written in collaboration with Julian Fane (1861), imitations of Tennyson; *Serbski Pesme* (1861), imitations of Servian songs; *Orval, or the Fool of Time*, a work of importance because it is the only English reflection of the mystical poetry of Poland that arose after the extinction of Polish liberty (1869); *Fables in Song* (1874); *Glenaveril* (1885), a novel in verse; and *King Poppy* (1892), are his other most indicative works. Consult *Selections from Poems*, with preface by Betham-Edwards (London, 1890). Consult also Balfour, *History of Lord Lytton's Indian Administration, 1876-1880* (London, 1899).

M

M The thirteenth letter in the English alphabet. In form it is derived from the Phœnician 𐤌, through the Greek and Latin M with little variation to the present time. Its form in the Runic futhark, for example, is ᛗ, where it stands as the twentieth rune and is called *Mann*. The Greek name for the letter, *mu*, comes from the Phœnician *mu*, 'water.' This was probably the original form of the word, the Hebrew *mēm* being a translation.

Phonetic Character. Phonetically *m* is a labial nasal sound made by pursing the lips together and vibrating the vocal chords, at the same time allowing some nasal resonance. Popularly *m* and *n* are classed with liquids and semivowels. The sound *m*, particularly in the initial position, has been subject to but slight variations from the time of Indo-Germanic unity to the present, as Indo-Germanic **mātēr*, Sanskrit *mātar*, Greek *μήτηρ*,. Latin *mater*, Old Irish *mathir*, Old Church Slavic *mati*, Anglo-Saxon *mōdor*, English *mother*. Sometimes *m* is subject to the same doubling as other consonants. In common speech it is occasionally pronounced with an almost vocalic value, thus *helm* as *helum*, *chasm* as *chazum*.

As a Symbol. In Roman notation M = 1000; M with a dash over it = 1,000,000. In academic degree M. stands for Master (*magister*), as A.M.; for Medicine in M.D. (*Medicinæ Doctor*); for Member in M. P., Member of Parliament.

MAARTENS, mär'tĕns, Maarten (1858—). A novelist of Dutch birth and English training, whose real name is J. M. W. van der Poorten-Schwartz. His stories were written by him in English and first won fame in his adopted country and language, having been only lately translated into Dutch. Maartens's boyhood was passed in England, his school years in Germany, his university period in Holland, where he studied law. He has since resided near Utrecht, observing Dutch life minutely, yet with a cosmopolitan detachment that has led some to regard his descriptions as untrue, or at least disproportionate, and so unjust. His first novel, *The Sin of Joost Avelingh* (1889), was clever and successful both with critics and with the public. The public was fascinated by the story, the critics were won by the well-knit analysis of motive. The same qualities unite in *An Old Maid's Love* (1891) and *A Question of Taste* (1891), which mark a stylistic advance. *God's Fool* (1892) is, however, a novel distinctly superior to either of its predecessors. *The Greater Glory* (1894) was first to gain for Maartens that general and cosmopolitan recognition that has been accorded also to *My Lady Nobody* (1895) and to his later novels. Maartens is both an artist and a moralist. In all his books the moral idea dominates and gives distinction and dignity to the diction.

MAAS, mäs. An affluent of the Rhine. See Meuse.

MAAS, Joseph (1847-86). An English singer of Dutch descent, born at Dartford, Kent. He was solo chorister in Rochester Cathedral (1857-62), and then a clerk in Chatham Dockyard until he went to Milan to continue his vocal studies under San Giovanni (1869-71). His first appearance in London was at a concert in Saint James's Hall, and the following year he appeared at Covent Garden as the hero in Boucicault's *Babil and Bijou* (1872). After an American tour with Miss Kellogg's English Opera Company he was chief tenor in the Carl Rosa company (1878-81), next with Mapleson at Her Majesty's Opera, and in 1883 took the leading rôle in *Lohengrin*. He was most popular, however, as an oratorio or concert singer, for his acting was not on a par with his artistic vocalization. He sang at the Pasdeloup concerts in Paris (1884), and in the Bach-Handel Festival at Brussels (1885), and was tenor soloist in the first presentation of Dvořák's *Spectre Bride* and of Stanford's *Three Holy Children* at the Birmingham Musical Festival the same year. Massenet wrote *Apollo's Invocation* specially for Maas, who sang it at the Norwich Festival (1884), and he also gave the first rendering of the Chevalier des Grieux in Massenet's *Manon* (Drury Lane, 1885).

MAAS, Louis (1852-89). A German-American pianist and composer. He was born at Wiesbaden, but was brought up in London, studied with his father and at the Leipzig Conservatory, was a pupil afterwards of Liszt, and came to America in 1880. He made Boston his headquarters, conducted the Philharmonic Society (1881-82), taught at the conservatory, gave recitals in different cities of the United States, and composed a number of songs, as well as orchestral and pianoforte pieces. His American symphony, *On the Prairies*, was given in the Boston Music Hall (1883).

MAÁSIN, mȧ-ä'sĭn. A seaport of Leyte, Philippines, situated on the extreme southwest coast of the island (Map: Philippine Islands, J 9). It is a handsome and well-built town, and exports hemp. Population, 9674.

MAASS, mäs, Ernst (1856—). A German classical philologist, born at Kolberg, Pomerania; professor of classical philology in the University of Marburg. His studies cover a wide field, but he is best known for his investigations in Greek and Roman religion and for his works on Aratus. Among his published works are: *De Attali Rhodii Fragmentis Arateis* (Greifswald, 1888); *Aratea* (Berlin, 1892); *Arati Phænomena* (Berlin, 1893); *Commentariorum in Aratum Reliquiæ* (Berlin, 1898); *Orpheus, Untersuchungen zur griechisch-römischen altchristlichen Jenseitsdichtung und Religion* (Munich, 1895).

MAASSEN, mäs'en, Friedrich Bernhard Christian (1823-1900). An Austrian jurist, born at Wismar and educated at Jena, Berlin, Kiel, and Rostock. In 1855 he was made professor of Roman law at Pesth, and in the same year at Innsbruck. In 1860 he became professor of both Roman and canon law at Gratz, and eleven years later at Vienna. His works include: *Geschichte der Quellen und der Litteratur des kanonischen Rechts* (1870); *Neun Kapitel über freie Kirche und Gewissensfreiheit* (1876).

MAASTRICHT, mä'strĭkt. A city of the Netherlands. See Maestricht.

MAAT, or **MAT**. An Egyptian goddess of truth and justice, daughter of the sun or of Phthah. She guides the souls of the dead to Osiris. Maat is represented with the ostrich-feather, the hieroglyph for 'mat' (truth), on her head.

MAB (OIr. *medb*, queen of Connaught, mentioned in Irish poems of the twelfth century; hardly connected with Welsh *mab*, child). In Celtic folk-lore, the midwife of the fairies. In *Romeo and Juliet* (I. iv.) she is represented as the Queen of the Fairies, and her office, poetically transformed, is to deliver men's minds of fancies and dreams. She appears in Dryden's *Nymphidia*, and also in the poems of Ben Jonson, Herrick, and others. She furnished the title to Shelley's *Queen Mab.* Consult Halliwell, *Illustrations of the Fairy Mythology of a Midsummer Night's Dream* (Shakespeare Society Publications, London, 1845).

MABA, mä'bȧ. Semi-civilized Negroid tribes in the Sultanate of Wadai, in the heart of the Sudan, between Baghirmi and Darfur. They are the ruling people in the territory which was formerly called Dar Maba. Great interest attaches to them because of their share in the bloody war waged by the Mohammedanized inhabitants against the pagan negroes. Nearly all the many tribes in the sultanate belong to the former class. More than 500 years ago Moslem Arabs were in the country and won the Mabas to their faith. Consult Keane, *Africa* (London, 1895).

MABALÁCAT, mä'bȧ-lä'kȧt. A town of Luzon, Philippines, in the Province of Pampanga (Map: Luzon, C 6). It is situated on the Manila-Dagupán Railroad, about 15 miles north of Bacolor. Population, 10,600.

MABERY, mā'bẽr-ĭ, Charles Frederiç (1850—). An American chemist. He was born in Maine, graduated at the Lawrence Scientific School, Harvard, in 1876, and from 1875 to 1883 acted as assistant in chemistry there. In 1883 he was called to the chair of chemistry in the Case School of Applied Science, Cleveland, Ohio. In the *American Chemical Journal* he published numerous papers giving the results of original researches in the laboratory at Cambridge. After he removed to Cleveland he became associated with the electric production of aluminum. In this connection he invented a new method for the preparation of anhydrous aluminum chloride.

MA'BIE, Hamilton Wright (1846—). An American essayist, editor, critic, and lecturer, born at Cold Spring, N. Y. He graduated at Williams College in 1867, and at the Law School of Columbia University, New York City, in 1869. In 1879 he joined the editorial staff of the *Christian Union*, afterwards called *The Outlook*, of which he became associate editor. Mr. Mabie is well known as a public speaker and lecturer, and American culture owes him much for spreading a love of good reading in the United States. His works include: *Norse Stories, Retold from the Eddas* (1882); *Nature in New England* (1890); *My Study Fire* (1890); *Short Studies in Literature* (1891); *Under the Trees and Elsewhere* (1891); *In the Forest of Arden* (1891); *Essays in Literary Interpretation* (1892); *Essays on Nature and Culture* (1896); *Essays on Books and Culture* (1897); *Essays on Work and Culture* (1898); *The Life of the Spirit* (1899); *William Shakespeare, Poet, Dramatist, and Man* (1900); *A Child of Nature* (1901); *Works and Days* (1902); *Parables of Life* (1902). As these titles show, Mr. Mabie's books, with one or two exceptions, comprise essays or familiar talks on literature, on nature, and on the spiritual life. The keynote of Mr. Mabie's books is interpretation and appreciation, rather than minute scholarship.

MABILLON, mȧ'bē'yôN', Jean (1632-1707). A learned French Benedictine. He was born at Saint Pierremont in Champagne, became a member of the Congregation of Saint Maur in 1653, and gave his life to historical research. In 1682 and 1683 Colbert sent him to Burgundy and Germany to collect documents relative to the history of France, and in 1685 he was sent to Italy for a similar purpose. The results were published in the *Vetera Analecta* (4 vols., 1675-85), and *Musæum Italicum* (2 vols., 1687-89). He also published *Acta Sanctorum Ordinis Sancti Benedicti* (9 vols., 1668-1702); *Annales Ordinis Sancti Benedicti* (6 vols., 1703-39); *De Re Diplomatica* (1681; new ed. by Adimari, Naples, 1789). For his life, consult Chavin de Malan (Paris, 1843); Jadart (Rheims, 1879); Bäumer (Augsburg, 1892); also Broglie, *Mabillon et la société de l'abbeye de Saint Germain des Prés* (Paris, 1888).

MABINI, mȧ-bē'nē, Apollinario (?-1903). A Philippine insurgent. He was fairly educated in the Catholic College at Manila, and entered the Spanish public service, from which he resigned in 1896, when he was advocate of the public treasury. He immediately devoted himself to the Philippine insurrection, suffered imprisonment for nine months, getting no trial from the Spanish authorities, and then openly joined the revolutionary army. Although he was completely crippled by paralysis, he became the soul of the movement during Aguinaldo's temporary defection, then was the General's private counselor, and for a short time acted as Minister of Foreign Affairs and head of the Supreme Court. He surrendered in 1899, but refused to take the oath of allegiance until his return from exile in January, 1903.

MABINOGION, măb'ĭ-nŏ'gĭ-ŏn (Welsh, singular *mabinogi*, probably derived from *mabinog*, pupil of a bard), The. The title of a series of Welsh prose tales from the *Red Book of Hergest*, published by Lady Charlotte Guest in 1838. The Welsh text was accompanied by an English translation and explanatory notes, and the collection soon became the best-known monument of mediæval Welsh literature. Its contents, however, are far from being homogeneous. The tales differ greatly in age and subject-matter, part of them standing beside the old Irish sagas as representatives of very early Celtic tradition, while others seem to come from French sources and belong to a highly developed stage of Arthurian romance. Only a small part of the collection is strictly entitled to be called 'Mabinogion' at all. But as a result of Lady Guest's choice of title the term has come to be loosely and inaccurately applied to almost any prose tale of the Middle Welsh period. In the interpretation of the name, as well as in its application, Lady Guest was in error. She took the word *mabinogi* to mean a 'nursery-tale,' and consequently adapted her translation somewhat to the uses of children; but probably the word comes rather from *mabinog* (or *mebinog*), 'a literary apprentice,' or a young man who receives instruction from a qualified bard. The *mabinogi* was apparently the collection of tales which he was expected to know and which constituted his stock in trade. In one case, however, it should be said, the term is applied to a tale where it seems to have reference to the age of the hero; the apocryphal "Gospel of the Infancy" is called *Mabinogi Jesu Grist*.

The four genuine mabinogion, perhaps more accurately to be called the 'four branches of the mabinogi,' are the following: *Pwyll, Prince of Dyfed; Branwen, Daughter of Llyr; Manawyddan, Son of Llyr;* and *Math, Son of Mathonwy*. These tales go back, so far as their substance is concerned, to the very earliest period of Welsh tradition. They are even held by some to contain a body of material common to the Gaels and Britons, the two great branches of the Celtic world. Arthur and his court are unknown to these ancient tales.

Among the remaining tales (not strictly mabinogion) published by Lady Guest, several contain primitive elements and have been only half adjusted to the conditions of the Arthurian world. An example of this class is the story of *Kulhwch and Olwen*. The tales of *Owen and Lunet*, *Peredur ab Efrawc*, and *Geraint and Enid*, on the other hand, are the product of mediæval chivalry and are generally held to go back to French originals.

The Red Book of Hergest, from which Lady Guest derived her Welsh text of all these tales, is a manuscript of the fourteenth century. But some of the tales are preserved, in whole or in part, in manuscripts of the thirteenth century; and the present opinion is that the collection as a whole was put into its present shape as early as the end of the twelfth century. Certain minor interpolations may be assigned to the fourteenth century. The dialect is that of South Wales.

Bibliography. Lady Guest's edition has been superseded in large measure by the more accurate text of Rhys and Evans, *The Text of the Mabinogion and Other Welsh Tales from the Red Book of Hergest* (Oxford, 1887), and by the translation of J. Loth, *Les Mabinogion* (Paris, 1889). On the history of the tales, see the introductions to the works already cited; and compare Stephens, *Literature of the Kymry* (London, 1873); Rhys, *Studies in the Arthurian Legend* (Oxford, 1891); and a series of articles by E. Anwyl, in the *Zeitschrift für celtische Philologie*, vols. i. and ii.

MABLY, mȧ'blĕ', Gabriel Bonnot de (1709-85). A French writer. He was the elder brother of Condillac (q.v.), and was born at Grenoble, March 14, 1709. He was educated for the priesthood, but resigned the priestly calling, and became secretary of his uncle, Cardinal de Tencin, and attached to the bureau of the Minister of Foreign Affairs. He was a student of political science, generally from the point of view of the Encyclopædists; his theories go beyond Rousseau into a bold communism. Among his discussions of such questions should be cited *Entretiens de Phocion* (1763), and *Doutes proposés aux philosophes économistes* (1768). In 1784, in a publication entitled *Observations sur le gouvernement et les lois des Etats-Unis d'Amérique* (Eng. trans., London, 1784), he predicted the early downfall of the United States. In his old age he saw in everything proof that the world was going to the bad, and obtained the surname of 'Prophet of Evil.' He died in Paris, April 23, 1785. His complete works were reprinted, with his life, in twenty-four volumes (Paris, 1797). Consult Guerrier, *L'Abbé de Mably, moraliste et politique* (Paris, 1886).

MABOUIA, mȧ-bo͞o'yȧ (Brazilian name). A gecko of the tropical parts of South America—*Hemidactylus mabouia*. See Colored Plate of Lizards.

MABUCHI (1693-1769). A Japanese scholar, the first of the three distinguished men of learning (Motoori and Hirata being the others) who attempted to restore the native faith of Japan, Shinto, to its original purity. It had long been obscured by Buddhism and the Chinese philosophy when Mabuchi, influenced by a love of antiquity, began his labors. He attacked the foreign faiths and advocated a return also to the social simplicity of ancient times, conforming his mode of life to his teachings. He first made the ancient poetry of Japan accessible to modern students; and he added greatly to the knowledge of the past. He was a voluminous writer.

MABUSE, mȧ'bụz', Jan (c.1470-c.1541). A Flemish historical and portrait painter. His real name was Jan Gossaert, but he adopted the name of Mabuse from his native town Maubeuge (Hainault). His early works show the influence of Gherard David and Quinten Massys. In 1513 he was admitted to the guild of painters at Antwerp. He was in the service of Philip of Burgundy, whom he accompanied to Rome in 1508, and during a visit of eleven years in Italy he adopted the style of the Italian Renaissance, retaining, however, the Flemish types, color, and minuteness of detail. At the death of Philip, in 1524, he entered the service of Adolphus of Burgundy, whom he accompanied to Middleburg in Zealand. He painted for Christian II. of Denmark his dwarfs and children, and also portraits of royal personages for the Emperor Charles V. He died at Antwerp. After his visit to Italy his work became mannered; he used rich architectural backgrounds, and was the first to introduce the Italian style into Flanders. Good examples of his early period are an "Adoration of the Kings," in Castle Howard; a "Madonna Enthroned" (1501), in the Museum at Palermo; and a "Madonna by the Fountain," in the Ambrosiana at Milan. His later works include: "Adam and Eve," Hampton Court, England, and Berlin Museum; "Neptune and Amphitrite," Berlin Museum; "Danaë and the Golden Shower," Munich Gallery; "Young Girl Weighing Gold Pieces," Berlin Museum; "Jean Carondelet," Louvre, Paris; "Saint Luke Painting the Virgin," Rudolfinum, Prague; "Christ in the House of Simon," Brussels Museum.

MACA, mä'kȧ. A group of tribes of uncertain linguistic classification wandering in the forest region on the eastern slope of the Andes in Central Ecuador. They depend chiefly on hunting, but also cultivate some corn, yuca, and tobacco. They build huts of palm-leaves and make pottery. Their various subtribes are constantly at war with each other, their weapons being spears and blowguns, with poisoned arrows. Like the Jivaro and other tribes, they dry the heads of slain enemies. They are not to be confounded with the Macú (q.v.).

MACABEBE, mä'kȧ-bā'bȧ. A branch of the Pampangos, north of Manila Bay, Luzon. They were friendly to the United States at the time of the Tagalog insurrection.

MACABEBE. A town of Luzon, Philippine Islands, in the Province of Pampanga (Map: Luzon, D 7). It is situated in the delta of the Rio Grande de la Pampanga, 9 miles north of Manila Bay, and about the same distance southeast of Bacolor. Population, 10,400.

MACABI, mȧ-kä'bē. A local name in the West Indies for the lady-fish (*Albula vulpes*), also called 'sanducha.' See LADY-FISH.

McADAM, măk-ăd'am, JOHN LOUDON (1756-1836). A famous highway engineer of Scotland, who originated the method of macadamizing roads. He was born at Ayr, Scotland, September 21, 1756, but passed his youth in New York. His interest in road construction was aroused while serving as a road trustee in Ayrshire. After much experimentation, largely at his own expense, he reached the conclusion that broken stones supplied the best material for road construction when applied in a specified manner. In 1798 he removed to England and in 1815 was appointed to superintend the roads of the Bristol district. In 1827 he was appointed general surveyor of the metropolitan roads, and, in reward for his exertions to render them efficient, received a grant of £10,000 from the Government. His system rapidly became general throughout England, and was also introduced into France with great success. McAdam died at Moffat, in Dumfriesshire, November 26, 1836. His work became famous, and his two books, *A Practical Essay on the Scientific Repair and Preservation of Roads* (1819), and *Present State of Road-making* (1820), were widely read. See ROADS.

McADOO, măk-ȧ-dōō', WILLIAM GIBBS (1820-94). An American jurist, born near Knoxville, Tenn. He graduated in 1845 at East Tennessee University, and in 1845 and 1846 was a member of the State Legislature. In 1847 he served in the Mexican War, subsequently was admitted to the bar, and from 1851 to 1860 was Attorney-General of the Knoxville judicial district. During the Civil War he served as a captain in the Confederate Army, and in 1871 became judge of the Twentieth Judicial District of Georgia. He published various addresses, a volume of poems, and (with Prof. H. C. White) *Elementary Geology of Tennessee.*

MACAHUBA (mä'kȧ-hōō'bȧ) **PALM.** See MACAW-TREE.

MACAIRE, mȧ-kâr'. A mediæval *chanson de geste,* which dates from about the twelfth century. In some form or other it can be traced through most European literature. The theme of the chanson is the persecution of Blanchefleur, wife of Charlemagne, by Macaire de Losane. In its present form it is a translation, in a mixture of French and Venetian dialects, and was published in 1856 by F. Guessard. The story contains a version of the famous "Dog of Montargis" legend (see MONTARGIS), in which a faithful dog exposes his master's murder and in combat kills the murderer. ROBERT MACAIRE is a modern type of rogue in French comedy. At first the character represented merely the ordinary brigand cutthroat, but it was developed by Frédéric Lemaître into a fantastic type of thief and assassin. There is a melodramatic farce in three acts by Robert Louis Stevenson and W. E. Henley entitled *Macaire.*

McALESTER, MILES DANIEL (1833-69). An American soldier, born in New York City. He graduated from West Point in 1856, entered the engineer service, and was made first lieutenant in 1861. After serving at various places in the East, he became in October, 1862, chief engineer of the Department of the Ohio. He later served with General Grant in the siege of Vicksburg and took part in the operations against Mobile. He was brevetted colonel, April 23, 1864, and a year later brigadier-general. He continued in the engineer service after the war closed.

MACALESTER COLLEGE. A coeducational institution of learning under Presbyterian control in Macalester Park, Saint Paul, Minn., founded in 1884. It has an academy and a collegiate department, a music department, and a summer school. It confers the degrees of A.B. and Litt. B. In 1902 the attendance was 80 in the academy and 90 in the college. The library contained 8000 volumes. The faculty numbered 15. The college buildings with the grounds are valued at $160,000. The income was $18,000.

McALL, m'-kąl', ROBERT WHITAKER (1821-93). An English Congregational minister, founder of the McAll Mission in France. He was born in Macclesfield, was educated at the University of London (1847), and held pastorates in different cities of England until he was fifty years of age. At that time, while minister of a Congregational church in Hadleigh, he went with his wife for a holiday across to Paris, where they saw the aftermath of the Commune. While Mr. McAll was addressing a street gathering in the Rue de Belleville, a workman spoke out from the crowd: "If any one will come among us teaching a religion, not of hierarchy and superstition, but of reality, and earnestness and liberty, very many of us are ready to listen." The McAlls accepted the invitation, and six months afterwards (January, 1872) they opened the Mission Populaire Evangélique de France in a small room in the Rue Julien Lacroix, Belleville, the locality in which the priests had been murdered during the Reign of Terror. The rest of his life Mr. McAll devoted to the interests of the mission. For his success in promoting public morality and education in France he was decorated with the cross of the Legion of Honor in 1892. He was an accomplished musician, and with his wife prepared a French Protestant hymn book. See McALL MISSION.

McAL'LISTER, FORT. See FORT McALLISTER.

McALLISTER, WARD (c.1830-95). An American society leader. He was born in Savannah, Ga., where his family had long been prominent in legal circles, and in 1850 accompanied his father to California. Two years later he returned to the East and made his home at Newport and later in New York City. Through his mother and his wife he was connected with many prominent Eastern families, and as he had by his marriage secured a comfortable fortune, he devoted himself to social life. In this he succeeded so well that in time he became the most conspicuous leader of New York society. He was a famous gourmet and a delightful story-teller, but would probably never have become known outside of his own limited circle had it not been for his chance remark that New York's 'smart' society comprised only 400 persons, which was widely copied in the newspapers and was the origin of the term 'The Four Hundred.' His contributions to the press and his book, *Society as I Have Found It* (1890), did much to undermine his social influence.

McALL MISSION. An undenominational Protestant organization for religious work among the laboring people of France, where it is known as the *Mission Populaire Evangélique de France.* It was founded in 1872 by the Rev. R. W. McAll (q.v.) and his wife, with the full sympathy of the pastors of the Protestant churches of Paris. The first station was opened in January, 1872, in Belleville, one of the artisan districts of Paris. The work grew rapidly, spreading through France and into Corsica, Algeria, and Tunis. No attempt is made to found churches; the meetings are held in halls. Converts are directed to seek membership in the nearest church of their choice, the pastors of these churches giving much aid in the work of the halls. In three cases, however, churches have been founded in the halls, in two instances by the Reformed Church and in one by the Free Church of France. In addition to evangelizing work some educational and other institutional work is done in certain of the larger cities, but the work is maintained strictly on religious rather than benevolent lines. In 1902 there were 75 halls in Paris, the departments, and Corsica, with nearly 9000 sittings, and a total of 16,999 religious meetings, a large distribution of tracts, and nearly 25,000 domiciliary visits in the year. There are also two mission boats with nearly 300 sittings plying in the inland waterways of France. Several of the mission halls are worked in coöperation with one or another of the French home missionary societies. There has been a diminution in the number of stations since 1891.

The budget in 1902 was $68,302, contributed by friends in Great Britain, France, Alsace, Switzerland, Holland, Sweden, South Africa, Canada, and the United States. The American McAll Association was founded in 1883 in Philadelphia for the purpose of collecting and forwarding funds for the support of the mission, and it contributes nearly one-half the support of the work. It now embraces sixty-six auxiliaries in different cities. There is an association in Canada with ten auxiliaries and there are twenty-two auxiliaries in Great Britain and the Channel Isles.

McAL'PINE, WILLIAM JARVIS (1812-90). An American civil engineer. He was born in New York, and after completing his education began engineering and later directed the eastern division of the Erie Canal enlargement until 1846, when he was chosen to construct the drydock at the Brooklyn Navy Yard. In 1852 he was elected State Engineer of New York, and in 1854-56 State Railroad Commissioner. Subsequently he was for two years engineer and acting president of the Erie Railroad, and constructed the water-works of Chicago and Albany. In 1870 he presented plans which were accepted by the Austrian Government for the improvement of the cataracts of the Danube.

MACAO, mȧ-kou′ (In Chinese *Ngao-mun;* probably derived from *A-ma-ngao,* the bight or inlet of the goddess Ama). A Portuguese settlement near the western entrance to the Canton River, China, 40 miles west of the British colony of Hong Kong; latitude 22° 11′ N., longitude 113° 33′ E. (Map: China, D 7). It occupies a small peninsula, formerly an island but now connected by a narrow spit or neck of land, formed by the action of the tides, with the island and prefecture of Hiang-shan, on the north; area four square miles; population, in 1896, 78,627, of whom 3898 were Portuguese, and 74,568 Chinese.

The town is built on an irregular tableland, which occupies the central and narrower part of the peninsula and connects several rugged, rapidly disintegrating granite hills from 200 to 500 feet high on the south, with a few somewhat lower hills on the north, where the land slopes away into an alluvial plain about half a mile wide. Still further north this rapidly narrows into the spit of land already mentioned, across which a barrier was erected by the Chinese in 1573. The place is defended by numerous little-needed forts erected in the seventeenth and eighteenth centuries. Within the walls of one of them—Fort Guia—was erected in 1865 the first lighthouse on the China coast. It has a tower 333 feet above the sea.

Macao possesses a cathedral, many churches, a theatre, several hospitals, and charitable institutions, but no buildings of special importance or architectural beauty, the most striking object being the façade of the ancient Collegiate Church erected by the Jesuits in 1594, converted into barracks on the expulsion of the Jesuits in 1759, and almost totally destroyed by fire in 1835.

Macao is well situated for trade and flourished until the opening of Hong Kong as a free port, but the increasing shallowness of its inner harbor (formed on the west by the large island of

Patera), and the exposed position of the equally shallow roadstead on the east, unfit it for a great seaport, modern vessels having to lie off shore from three to six miles. Its trade is now chiefly in transit with Hong Kong and Canton, and is for the most part in the hands of the Chinese and Parsis. In 1898 it was valued at $18,858,000. The climate of Macao is delightful and many Europeans from Hong Kong and other southern ports are attracted here during the summer. The mean temperature is 74° F., and the annual rainfall about 67 inches, chiefly in July and August.

The Portuguese first settled here in 1577 when certain merchants who had squatted on the island of Lampaco, and who had assisted the Chinese authorities in dealing with pirates, were permitted to move hither to erect warehouses. Though Portugal sent out a royal Governor in 1628, Macao continued to be regarded by the Chinese as Chinese territory until 1887, when by treaty China relinquished her claim on condition that the land should never be alienated without China's consent. It is now, therefore, governed wholly as a Portuguese colony. All through the stormy days of early foreign relations with China, Macao was a place of safe retreat for both the merchant and the missionary. Here Wells Williams set up his printing press in 1844, and here in the old Protestant Cemetery are the graves of many British and Americans who died at Macao, among them Robert Morrison, the first Protestant missionary to China. Camões, the Portuguese poet, spent eighteen months of exile here, and on one of the hills is pointed out the grotto in which it is said he composed part of the *Lusiad*. Macao is notorious for its gambling houses, the tax on which provides most of the public revenue, and for its share in the infamous coolie traffic which came to an end only in 1873. See Soyeshima.

MACAPÁ, mä-kȧ-pä′. A town in Brazil, on the north shore of the Amazon delta, 110 miles from its mouth (Map: Brazil, G 3). It is a fortified town with an excellent harbor, and has a good export trade in timber and cabinet woods. Population, 4000.

MACAQUE, mȧ-kȧk′ (Fr. *macaque*, from *macaco*, *macaquo*, the native name). An Asiatic monkey of the genus Macacus, of the family Cercopithecidæ (q.v.). These monkeys are of moderate size, the males always decidedly larger than the females and with stronger canine teeth; they have cheek pouches and large ischial callosities; and the tail is usually short. Many of the monkeys seen in menageries are macaques. When young they are docile and active, but as they grow old they become morose and exhibit some of the ferocity of their cousins the baboons. They are naturally forest-dwelling animals, and go about in troops which comprise individuals of both sexes and of all ages. These troops do not mix with other monkeys, and the voices and gestures of all the macaques differ markedly from those of the langurs and other Oriental monkeys. Their diet is varied, and includes, besides the ordinary insects, fruits, and succulent leaves, lizards, frogs, and crustaceans. One of the most widely known, called by the Malays 'kra' (*Macacus cynomologus*), feeds mainly on crabs caught along the seashore. More familiar is the bonnet monkey (*Macacus Sinicus*), which takes its name from a quaint crest of upright hair on the crown, and is numerous all over Southern India, where it makes itself a nuisance by pillaging the provision shops. A closely related species, the 'rilawa' (*Macacus pileatus*), is a favorite pet and trick monkey in Ceylon. Various other species are scattered through the Orient, of which the lion-tailed and rhesus monkeys are elsewhere described; the 'pig-tailed' (*Macacus leoninus*) is notable for its size and short pig-like tail; and the Japanese species (*Macacus fuscatus*), whose tail is thickly haired, is the monkey so constantly represented in Japanese art. The most interesting of all the macaques, however, is the single species making its home west of India—the 'magot' or Barbary ape (*Macacus inuus*).

Barbary Ape. This is the ape of the Rock of Gibraltar and the opposite coast of Africa, and hence remarkable as the only monkey living wild in Europe. Whether it was indigenous on the European side of the strait, or was taken there by human agency in some past time, cannot now be determined, but these apes are frequently imported from the mountains of Algeria and Morocco, where they are a great pest to the Arab rustics, whose orchards and vegetable gardens they plunder; when this resource fails they live upon pine-nuts, chestnuts, and the like. Their habits are similar on Gibraltar, where a score or more are carefully protected as a public curiosity. This ape is undoubtedly the 'pithecus' of Aristotle and other ancient writers; and it was the animal from which the Greek and other physicians obtained all the information they had in regard to human anatomy.

Fossil remains of macaques occur in the Pliocene rocks of Europe, and there is evidence that apes of this genus inhabited Great Britain in the Pleistocene period. See Monkey; and Plate of Monkeys of the Old World.

MAC′ARO′NI (It. *maccheroni*, OIt. *maccaroni*, from *maccare*, Lat. *macerare*, to macerate). Wheat paste, usually in the form of tubes or threads, varying in diameter; formerly an exclusive product of Italy, but now made in France, the United States, and other countries. Wheat containing a large percentage of gluten is required, and for this purpose the hard red wheat from the Black Sea coast is mixed with the Italian wheat. The wheat is first ground into a coarse meal, from which the bran is removed. In this state it is called *semola* or *semolina*. The semola is worked up into a dough with hot water and the dough is placed in a vertical cylinder of brass, 8 or 9 inches in diameter, the bottom of which is perforated with holes of the size desired. In making vermicelli and all kinds of solid macaroni the holes are very small: but in making the tube macaroni the holes are larger and have a conical blade inserted to form the tube. The dough is squeezed out of the cylinder through these holes, by hydraulic pressure, and cut off in lengths of about three feet. The tube macaroni emerges with a hollow centre and a slit along one side where the conical knife is attached, but this quickly closes, forming a perfect tube. The sticks are then dried in the sun and are ready for shipment.

The laborious hand process of making macaroni formerly employed has been given up. It is said that the best macaroni is made in Grognano and Torre dell' Annunziata, Italy. The manufacture of macaroni is of great importance to Italy, where it forms a large article of home consumption and from which country it is exported to all parts of the world. Over 500,000 boxes of macaroni are sent annually to the United States, and about 70,000 to London.

MACARONI CLUB. A club of London exquisites in the latter part of the eighteenth century, said to have taken their name from their favorite dish. They were noticeable on account of their fantastic costume, which included an eccentric style of hair-dressing, a small hat, short coat, tight silk breeches, and a tasseled stick.

MAC'ARON'IC VERSE (It. *maccheronico*, relating to macaroni, from *maccheroni*, macaroni). Properly, a kind of humorous poetry, in which, along with Latin, words of other languages are introduced with Latin inflections and construction; but the name is sometimes applied to verses which are merely a mixture of Latin and the unadulterated vernacular of the author. Teofilo Folengo, called Merlino Coccajo, a learned and witty Benedictine, who was born at Mantua in 1491, and died in 1544, has been erroneously regarded as the inventor of macaronic poetry; but he was the first to employ the term, selected with reference to the mixture of ingredients in the dish called macaroni. His *Maccaronea* (published in 1521, and many editions) is a long satiric poem, in which Latin and Italian are mingled. Fortunately, macaronic poetry has not been very extensively cultivated, although specimens of it may be found in the literature of almost all European countries. The idea of it was probably first suggested by the barbarous monkish Latin. There is a history of macaronic poetry, and a collection of the principal works of this kind by Genthe, *Geschichte der maccaronischen Poesie* (Halle, 1829). Compare also Octave Delapierre's *Macaroneana* (Paris, 1852), and his *De la littérature macaronique et de quelques raretés bibliographiques de ce genre*, vol. ii. (Paris, 1856); Morgan's *Macaronic Poetry* (New York, 1872); and Brunet's *Littérature macaronique* (Paris, 1879).

MACAROON (Fr. *macaron*, from OIt. *maccaroni*, macaroni). A favorite kind of biscuit, made with the meal of sweet almonds, instead of wheaten or other flour. The almond-meal dry, or, what is still better, almonds just blanched and beaten into a paste, is thoroughly incorporated with refined sugar in powder and the whites of eggs. When thoroughly mixed, the paste is made into the shape of small round or oval biscuits and baked.

MacAR'THUR, Arthur (1845—). An American soldier, born in Massachusetts. He entered the United States Army as first lieutenant in the Twenty-fourth Wisconsin Infantry, in August, 1862, participated in the battles of Perryville, Stone River, and Chattanooga, and in the Atlanta campaign, and, after having attained the rank of lieutenant-colonel, was mustered out of the volunteer service in June, 1865. In February, 1866, he entered the Regular Army as first lieutenant, and in July, 1889, he became assistant adjutant-general, with the rank of major. He was appointed brigadier-general of volunteers in May, 1898, and major-general of volunteers in August of the same year, and in 1898-99 was engaged on special duty in Havana, Cuba. In 1899 he was sent to the Philippine Islands, and in 1900 succeeded General Otis as commander of the Division of the Philippines and military Governor of the islands. In January, 1900, he was promoted to be a brigadier-general in the Regular Army, and in Feburary, 1901, to be major-general. Upon his return to the United States he was placed in command of the Department of the Lakes, whence he was transferred to the Department of California.

McAR'THUR, Duncan (1772-1839). An American soldier. He was born in Dutchess County, N. Y., and his family having removed to Pennsylvania in 1780, he served as a volunteer in Harmar's campaign against the Miami Indians, and in later campaigns on the frontier. In 1805 he was elected a member of the Legislature of Ohio, in which State he was a great landed proprietor. He entered the War of 1812 as colonel of an Ohio volunteer regiment, was promoted to a brigadier-generalship in 1813, and the next year succeeded General Harrison as commander of the Army of the West. He was a member of the State Legislature in 1815-21, a member of Congress in 1823-29, and from 1830 to 1832 Governor of Ohio.

MacARTHUR, Robert Stuart (1841—). An American Baptist clergyman. He was born at Dalesville, Province of Quebec, Canada; graduated at the University of Rochester in 1867, and at the Rochester Theological Seminary in 1870, and in the latter year became pastor of the Calvary Baptist Church, in New York City. For a considerable period he was one of the editors of the *Christian Inquirer* and of the *Baptist Quarterly Review*. He participated in the preparation of *The Calvary Selection of Spiritual Songs*, *Laudes Domini*, and *The Calvary Hymnal*. His publications also include volumes of sermons and other works of a popular character.

MACART'NEY, George, Earl Macartney (1737-1806). A British diplomat. He was born at Lissanoure, near Belfast, Ireland; graduated at Trinity College, Dublin, 1757; studied law in London; then made the tour of Europe, and on his return in 1764 was appointed Envoy Extraordinary to the Empress of Russia, to conclude a commercial treaty with that country. Returning in 1767, he sat for a time in the British Parliament, and from 1769 to 1772 was Chief Secretary for Ireland. Appointed Governor of the island of Grenada in 1775, he was taken prisoner on the capture of that island by the French in 1779, but was soon released by Louis XVI., and allowed to return to England. In 1776 he was raised to the Irish peerage with the title of Baron Macartney. From 1780 to 1786 he was Governor of Madras. In 1788 he took his seat for the first time in the Irish House of Peers; in 1792 was made an Irish viscount, and went as Ambassador Extraordinary to Peking, the first British Envoy sent to China. In 1794 he was made Earl Macartney in the Irish peerage, and returned from China. In 1796 he was made a British peer with the title of Baron Macartney, and at the end of that year was appointed Governor of the newly captured territory at the Cape of Good Hope. In 1798 he resigned on account of declining health, and for the same cause declined the offer of a seat in the Cabinet of the Addington Ministry in 1801. He died at Chiswick. Consult: Staunton, *Macartney's Em-*

bassy to China (London, 1797); Barrow, *Life and Writings of Lord Macartney* (London, 1807).

MACARTNEY COCK, or FIRE-BACKED PHEASANT. See PHEASANT.

MACAS'SAR. The capital and chief commercial seaport of Celebes, Dutch East Indies, situated on the eastern coast of the island, in latitude 5° 20′ S., and longitude 119° 28′ E. (Map: East Indies, E 6). It is well built, and is fortified by palisades and two forts. It exports rice, coffee, rubber, cocoa oil, mother of pearl, etc. The value of its annual trade exceeds $6,000,000. The Governor of Celebes and its dependencies resides at Macassar. Population, about 18,000, including about 1000 Europeans.

MACASSAR OIL. A fixed vegetable oil, named from the district of Macassar, in the island of Celebes, where it is produced and obtained from the fruit of the *Stadtmannia Sideroxylon.* The name, however, has been given to a pomade made from almond, olive, or peanut oil, to which other substances are added to give color and perfume.

MACAS'SARS, or **MANGKAS'SARS.** A Malayan people, occupying that portion of Southern Celebes known as Macassar. In 1875 the number speaking Macassar was estimated at 320,000, and those using the closely related Buginese at 680,000, but these figures are too high. The Macassars are described as of milder habits, greater commercial ability and literary culture than many of the kindred tribes. Physically, they are rather taller and lighter skinned, and some of them are very good-looking. Consult: Lahure, *L'île Célèbes* (Brussels, 1880); Riedel, *De sluiken kroesharige rassen tusschen Selebes en Papua* (The Hague, 1886); Van Staden ten Brink, *Zuid-Celebes* (Utrecht, 1884); Meyer, *Album von Celebes-Typen* (Dresden, 1889).

MACASSAR STRAIT. A body of water which separates the islands of Borneo and Celebes, and unites the Java Sea with the Sea of Celebes (Map: East Indies, E 5). It varies in width from 75 to 140 miles, and is about 400 miles long. Owing to the numerous shoals and the strong south current during January and February, its navigation is very difficult.

MACATÓ, mä'kȧ-tō'. A town of Panay, Philippines, in the Province of Cápiz (Map: Philippine Islands, G 8). It is situated on the main road, 3 miles from the north coast of the island, and 33 miles west of Cápiz. Population, in 1896, 10,136.

MACAULAY, ma-kạ'lĭ, CATHARINE (SAWBRIDGE) (1731-91). An English historian. She is chiefly known for *The History of England, from the Accession of James I. to that of the Brunswick Line* (1763-83), once extremely popular and lauded by Pitt before the House of Commons, but characterized by Lord Macaulay as "more distinguished by zeal than either by candor or skill," and now unread. A pronounced republican, she made Franklin's acquaintance at Paris, and was a friend of Washington, whom she visited in America in 1785.

MACAULAY, Sir JAMES BUCHANAN (1793-1859). A Canadian jurist, born at Niagara. He entered the British Army, and during the War of 1812 fought at Ogdensburg, Oswego, and Fort Erie. He was afterwards admitted to the bar, became an executive councilor, and in 1829 a judge of the Queen's Bench Court. In 1849 he became the Chief Justice of the newly constituted Court of Common Pleas, resigning in 1856. For a short time he was judge of the Court of Error and Appeal. The commission for the consolidation of the statutes of Upper Canada owed the final completion of its task in 1858 largely to his efforts as chairman.

MACAULAY, THOMAS BABINGTON, Lord Macaulay (1800-59). An eminent English historian and statesman. He was born at Rothley Temple, Leicestershire, October 25, 1800, being the eldest son of Zachary Macaulay. As a child he was most precocious, reading voluminously from the age of three, writing a universal history at seven, and composing treatises, poems, ballads, and hymns at ten. At twelve, after a childhood influenced beneficially by the judicious counsel of Hannah More, he was sent in 1812 to the private school of a Mr. Preston. During the years spent there, he advanced with the rapidity of which his earliest days had given such ample promise, and in 1818 entered Trinity College, Cambridge, where he acquired a brilliant reputation both as a scholar and a debater. Twice he won first honors in the English prize-poem contest—in 1819 by a poem on "Pompeii," and in 1820 by another on "Evening"—but was debarred by his distaste for mathematics from securing the much-coveted chancellor's medal. In 1821 he obtained the second Craven scholarship, in 1822 took the bachelor's degree, and in 1824, after two unsuccessful trials, was elected a fellow of Trinity, and began to devote himself zealously to literature. The first medium of his writings was *Knight's Quarterly Magazine*, circulating chiefly among the students at Eton and Cambridge. For this he wrote several of his earliest ballads—e.g. *The Spanish Armada, Moncontour, The Battle of Ivry*—and numerous essays and critiques. In 1825 he took the master's degree, and in the same year made his appearance in the columns of the Edinburgh *Review*, with his famous essay on Milton. The learning, eloquence, brilliancy, and generous enthusiasm of this attracted the instant attention of the educated public, and opened to the young author the highest social privileges. Into the enjoyment of these new-found honors he was just beginning to enter, when the culmination of family financial misfortunes brought him temporarily to almost abject poverty. In 1826 he was called to the bar at Lincoln's Inn; but two years' pretense at practice left him unadvanced in the profession, for he had a greater penchant (encouraged by the circumstances of his early home training) for politics than for the courts. In 1830 the friendship of Lord Lansdowne, holder of the 'pocket borough' of Calne, opportunely opened the way for his entrance into the political world at one of its most critical moments. Once in Parliament, he threw himself with characteristic earnestness into the reform movement, becoming one of the leading members of the rising Whig Party through his splendid eloquence and effective argument. On the victory of his party in 1832 he was made one of the Board of Control of Indian Affairs. In 1834 reappearing financial necessity compelled him somewhat reluctantly to leave England and enter the active India service as a member of the Supreme Council. During the four years thus spent his ability found expression in the creation of a new and humane penal code, and in continued literary labors. Returning to England in 1838, he resumed his political career, being in 1839 elected a member of Parliament for the city of Edinburgh. Accepting later in the same year a Cabinet position in the Melbourne Ministry, he shared its fall in 1841. In 1842 appeared his magnificent martial ballads, *Lays of Ancient Rome,* and in 1843 three volumes of *Essays.* Having devoted five years to combined literary work and powerful aid to the Whig opposition, he was, on the return of his party to power in 1846, restored to office, this time as Paymaster-General. The loss of his seat in Parliament, however, incurred in 1847 through his too zealous advocacy of religious toleration at an unpopular moment, offered him at length an opportunity for devoting himself seriously to the work for which he had been planning during several years—his great *History of England from the Accession of James II.* The first two volumes of the work appeared in 1848, and achieved at once such an extensive and enduring success as had hitherto been the lot of the most popular novelists alone. The year following their appearance he was elected lord rector of the University of Glasgow, and was offered a position again in the Cabinet under Lord Russell, which latter honor, however, he declined. In 1855 Edinburgh made such reparation for its slight of 1847 as it could, by returning him unsolicited to his former seat in Parliament. Declining an offer of the professorship of modern history at Cambridge, he devoted himself more assiduously to the writing of his *History.* The appearance of the third and fourth volumes in 1855 created a furor of excitement among publishers and readers. In the United States their sale exceeded that of almost every book except the Bible. In 1857 the French Academy of Moral and Political Science made him a foreign associate; and in the course of the same year he was raised to the peerage of Great Britain under the title of Baron Macaulay of Rothley. But ill health, interrupting his work as early as 1852, had by 1857 made serious inroads upon his physical strength. He died rather suddenly on December 28, 1859, at Holly Lodge, a quiet retreat to which he had retired in 1857. His premature death left uncompleted his great *History,* which extended only through the period of William III. when its author's work ended.

Macaulay was indisputably a man of splendid talent. His scholarship—in the strictly classical sense of the term—was admirable; his miscellaneous literary acquisitions were something prodigious; his knowledge of modern European, and especially of English, history from the age of Henry VIII. down to his own, was unsurpassed. While his *History* will always be read on account of its wonderful style, there can be no doubt of its partiality and exaggeration. Moreover, Macaulay indulged in his passion for epigram at the expense of truth; and his *History* has been justly termed a "huge Whig pamphlet."

The only complete edition of Macaulay's works is that published by his sister, Lady Trevelyan (London, 1866); the chief authority on his life is Trevelyan, *Life and Letters of Lord Macaulay* (London, 1876, and New York, 1877). Considerable useful material may be found in Arnold, *Public Life of Lord Macaulay* (London, 1862), and Milman's *Life* prefixed to vol. viii. of *History of England* (London, 1858-62).

MACAULEY, CATHARINE E. (1787-1841). An Irish philanthropist. Adopted by a wealthy family, she received a considerable fortune, with which in 1827 she founded 'The House of Our Blessed Lady of Mercy,' devoted to the care of the sick. She later became superior of the Order of the Sisters of Mercy, to which the Dublin institution gave rise, and which spread through Europe and America.

McAULEY, m'kạ'lĭ, 'JERRY,' or JEREMIAH (1839-84). A lay revivalist. He was born in Ireland, came when a boy of thirteen to New York, and grew up as a criminal. On a false charge of highway robbery he was sent to Sing Sing prison (1857), but he was pardoned (1864), and relapsed into evil ways. In 1872 he was converted and from then till his death (September 18,1884) he spent his energies in successful efforts to convert others and by choice those who were so degraded that few would deal with them. The first scene of his labors was in Water Street, New York City, but in 1882 he opened the mission on West Thirty-second Street which now bears his name, 'The Jerry McAuley Cremorne Mission.' Consult his *Life* by Offord (New York, 1885).

MACAW (Brazilian *macao*). One of the large strong-flying and gaudy South American parrots of the group Arinæ, known locally as araras. They are distinguished by the very long wedge-shaped tail, long and pointed wings, large strong feet, naked cheeks, and short, very strong, highly arched bill. They do not readily learn to articulate words, but are easily domesticated, and become much attached to those with whom they are well acquainted. Their natural notes are hoarse and piercing screams; and as they cannot be taught not to scream, they are often unpleasant captives. They are more or less gregarious, and a flock of macaws seen in bright sunshine is wonderfully brilliant. They lay their eggs, generally two, in the hollows of decayed trees; feed chiefly on fruits and seeds; and often commit great depredations on fields of maize. In domestication, macaws readily eat bread, sugar, etc. The great scarlet macaw (*Ara coccinea*) is sometimes more than three feet in length including the long tail. The red and yellow green-winged macaw (*Ara chloroptera*) and the green macaw (*Ara nobilis*) are rather smaller. These are among the best-known of a large number of species. Compare PARRAKEETS. See Plate of COCKATOOS AND MACAWS.

MACAW TREE (*Acrocomia sclerocarpa*). A palm of the same tribe with the cocoanut, a native of tropical and sub-tropical America, called macoya in Guiana, and macahuba in Brazil. It is from 20 to 30 feet high, with pinnated leaves, from 10 to 15 feet long. The fruit yields a sweetish yellow violet-scented oil, of the consistence of butter, used where the tree is indigenous as an emollient in painful affections of the joints, and in rheumatism. It is largely exported as palm oil, for use in the manufacture of toilet-soaps. The leaves yield a fibre characterized by its remarkable fineness and softness. The tree is cultivated to some extent as an ornamental in southern California.

MAÇAYÓ, mä'sĭ-yō'. A city of Brazil. See MACEIÓ.

MACBETH' (?-1057). A king of Scotland. From his father, Finlay, he inherited the rule of the Province of Moray. In the year 1040 he revolted against King Duncan of Scotland and killed him at Dunsinane. Macbeth now ascended the throne and reigned for about seventeen years. He made grants to the Culdees of Lochleven, and in the year 1050 went on a pilgrimage to Rome. Malcolm MacDuncan, or Canmore, the eldest son of King Duncan, had fled to England on his father's death; and in the summer of 1054 his kinsman, Siward, Earl of Northumberland, led an English army into Scotland against Macbeth. The King was defeated with great slaughter, but escaped from the field and still kept the throne. Three years afterwards he was defeated by Malcolm MacDuncan, and slain at Lumphanan, on August 15, 1057. Macbeth left a nephew, Luloch, who was slain in 1058 at Essie, in Strathbogie. Consult: Skene, *Celtic Scotland* (3 vols., Edinburgh, 1876-80); Robertson, *Early Kings of Scotland* (2 vols., Edinburgh, 1862); Boswell-Stone, *Shakespeare's Holinshed* (New York, 1896).

MACBETH. A tragedy by Shakespeare, written probably in 1606, printed in 1623. Dr. Forman saw it acted at the Globe in 1610. The source of the plot is Holinshed's *Chronicles of Scottish History* (1577), taken from Bellenden's translation (1536) of Hector Boece's Latin *Historia Scotorum* (1526). Lady Macbeth was doubtless suggested by another passage in Holinshed, "The Murder of King Duffe," of which a metrical version is found in Wyntoun's *Chronicle of Scotland* (1400). The historical prototypes of the tragedy lived about 1040, and the actual Macbeth seems to have had as good a right to the throne as Duncan, both being grandsons of a former king. That the play was written soon after James I.'s accession, when a Scotch theme was appropriate, seems probable from the allusion in Macbeth's vision, "Some I see that twofold balls and treble sceptres carry;" and also when Banquo, the fabled ancestor of the Stuarts, is not made to share in the murder, as was the actual case. Macbeth is Shakespeare's shortest work, and evidently much mutilated. In 1674 it was reproduced with 'amendments' by D'Avenant, and some changes taken from Middleton's *Witch*, which was originally imitated from *Macbeth*.

McBUR′NEY, Charles (1845—). An American surgeon. Born in Roxbury, Mass., McBurney received his early education in private schools in Boston, and was graduated from Harvard in 1866. He received A.M. from Harvard in 1869, and M.D. in 1870 from the College of Physicians and Surgeons, New York City. He has been connected with the faculty of that institution as assistant demonstrator of anatomy (1872-74); demonstrator of anatomy (1874-80); lecturer on anatomy (1878-80); clinical lecturer and instructor in anatomy (1882-89); professor of surgery from 1889 to the present time. Dr. McBurney was sole attending surgeon to Roosevelt Hospital from 1886 to 1902. He is consulting surgeon to Roosevelt, Saint Luke's, Saint Mark's, New York, and Presbyterian hospitals, and to the Hospital for Ruptured and Crippled, all in New York City. He is widely known as a most skillful operative surgeon, and is a member of many medical bodies.

McBURNEY, Robert Raikes (1837-98). An American religious worker, general secretary of the New York Young Men's Christian Association. He was born in Castleblaney, Ireland, and came to this country in 1854. In 1862 he received a salaried position, the first to be provided for by the association. He gave his entire life to this work.

McCABE, ma-kāb′, Charles Cardwell (1836 —). An American Methodist clergyman, born in Athens, Ohio. He studied at the Ohio Wesleyan University, and entered the Ohio Conference in 1860. In 1862 he enlisted as chaplain in the Federal Army, and joined the 122d Ohio Infantry. At the battle of Winchester he was taken prisoner, and was in Libby Prison for four months. He rejoined his regiment, but soon afterwards was engaged as a lecturer by the Christian Commission. Subsequently he held a pastorate at Portsmouth, Ohio. In 1866 he was appointed agent of the Centenary Fund and two years later was made agent of the Church Extension Society. In 1884 he was appointed corresponding secretary of the Missionary Society of the Methodist Episcopal Church. He was consecrated a bishop in 1896.

McCABE, James Dabney (1842-83). An American writer. He was born in Richmond, Va., was educated at the Virginia Military Institute, began very early to write for the press, and during the Civil War employed his pen in the service of the Confederate States. His chief work is *The Life and Campaigns of Gen. R. E. Lee* (1867); and he is also the author of a *Life of Gen. T. J. Jackson* (1863); a *Memoir of Gen. A. S. Johnston* (1866); *The Great Republic* (1872); and *Pathways of the Holy Land* (1877).

MAC′CABEES. The name given to a Jewish family of great prominence B.C. 167-37. The surname Maccabæus properly belongs only to the most prominent representative of the family, Judas, and in the Books of the Maccabees is given to him alone. From him the designation was applied to other members of the family. The common interpretation of Maccabæus as 'the hammerer' is open to objection, and there is no proof that it was given to Judas because of valor. The family are also called Asmoneans or Hasmoneans, from the name of an ancestor. The Maccabees first come into prominence in connection with the attempt of Antiochus IV., Epiphanes (B.C. 175-164), to crush out by force the rites of the Jewish religion and substitute the Greek cult therefor. (See Jews.) Every village in Palestine was required to set up an altar to the Greek gods and sacrifices were offered daily. At this juncture the aged priest Mattathias, with his five sons, Jochanan, Simon, Judah (Judas), Eleazar, and Jonathan, placed themselves in opposition to the King's policy. At the beginning of the trouble Mattathias was residing at Modin, a town about eighteen miles northwest of Jerusalem. When ordered to offer the first heathen sacrifice he resolutely refused. Apelles, a Syrian captain, endeavored to induce him by tempting promises to relinquish his faith and embrace the Greek religion. He answered by slaying with his own hand the first renegade Jew who approached the altar of idolatry and by pulling down the altar. The sons of Mattathias, with a handful of faithful men, rose against the national foe and fled to the mountains, where they raised the standard of rebellion. Mattathias died B.C. 166, and Judas became the leader of the patriots. For subsequent events, see the articles on the different members of the family, Judas Maccabæus; Jonathan; Simon Maccabæus; Hyrcanus; Aristobulus I.; Al-

EXANDER JANNÆUS; ARISTOBULUS II.; ANTIGONUS.

MACCABEES, BOOKS OF THE. Certain apocryphal Jewish writings, treating chiefly of the history of the Maccabees (q.v.). They consist of four books, of which the first two were received in the Vulgate, and declared canonical by the Council of Trent. The third is also considered canonical by the Greek Church. The First Book—the most important—comprises the period B.C. 175-135, and relates the attempt of Antiochus IV., Epiphanes, to suppress the Jewish cult and force the people into acknowledgment of the Greek gods (ch. i.); the rising of Mattathias and his sons against the oppressor (ch. ii.); the heroic deeds of Judas Maccabæus (chs. iii.-ix. 22); of Jonathan (chs. ix. 23-xii.); and of Simon, until the election of John Hyrcanus to the dignity of high priest (chs. xiii.-xvi.). The account bears, on the whole, the marks of great accuracy, and proceeds chronologically after the Seleucidan Era. According to Origen and Jerome, this book was originally written in Hebrew, and internal evidence confirms the correctness of this view. The original text is lost, but the Greek translation is a faithful reproduction. The author, a Palestinian and a patriotic Jew, was devoted to the Asmonean dynasty. He must have stood close to the centre of political life in Palestine. All the evidence available is in favor of the assumption that the book was finished shortly after the death of John Hyrcanus (say between B.C. 100 and 90), and the vividness of the descriptions makes it highly probable that the author was himself a witness of some of the Maccabean struggles and writes in part from personal observation and reminiscences. His attachment to the Jewish priesthood points to his having been a Sadducee. Except for the documents which the author incorporates into his book and the various speeches which are not to be regarded as authentic or verbatim (any more than in the narratives of Greek historians), the first book of Maccabees is a trustworthy source for the period it covers, though, of course, the events are colored by the author's fervent partisanship.

The second book of the Maccabees differs widely from the first. It also deals with the national uprising, but covers only the fifteen years from B.C. 175 to 161. Prefixed to the history are two letters (chs. i.-ii. 18), purporting to have been sent from the Palestinian to the Egyptian Jews, inviting them to celebrate the feast of the reinauguration of the temple. The author then announces in a preface the subject of his work and his source, which is a history of the period in 'five books,' composed by Jason of Cyrene (q.v.). Of this larger work he gives an epitome. He begins with the attempted spoliation of the temple by Heliodorus, under Seleucus Philopator, and ends with the death of Nicanor. The author concludes with an epilogue in regard to his own work. While the contents of the two letters correspond to the conditions prevailing at the time of the dates attached, which are equivalent to B.C. 143 and 124 respectively, the letters themselves are fabrications, and were probably written originally in Hebrew. The extract from Jason's work—a history embellished by additions, of a partly moralizing, partly legendary nature—contains many chronological and historical errors, and bears the stamp of being written merely for religious and didactic purposes. The history of Jason was composed by a contemporary of persons who had taken part in the Maccabean struggle, but he received his information orally at second hand. The epitomist, who also prefixed the two letters, wrote in Greek, apparently in Alexandria, toward the close of the first century B.C.

The third and fourth books of the Maccabees are only remotely connected with the Maccabean history. The third book may be described as a religious novel, the subject of which is the triumph of the Jews over their enemies. It deals with a supposed pre-Maccabean incident—the miraculous deliverance of the Jews of Egypt from the attempt of Ptolemy Philopator (B.C. 221-204) to destroy them in revenge for a humiliation which he suffered during a visit to Jerusalem, when he endeavored to enter the temple, but was prevented by divine intervention. Five hundred elephants are set upon the Jews, imprisoned in the hippodrome, but two angels intervene, and the elephants turn against the men of Ptolemy's army and trample them to death. The Jews are set free and the King, besides providing a banquet lasting seven days, issues a proclamation in their favor. The book, which has, of course, no historical value whatsoever, was probably written by an Alexandrian Jew in Greek at the close of the first century B.C., as an encouragement to the Jews in their struggle against Roman subjection. The book is not referred to by any of the early Jewish writers, and the earliest Christian witness to it occurs in the third century A.D.

The fourth book is of a homiletical character. It consists of two parts: (1) A philosophical discussion on the thesis that "the pious reason is absolute master of the passions;" followed by (2) illustrations of the thesis by stories of Jewish martyrs. In the second portion the author reproduces chapters iii.-vii. of the second book of Maccabees, which accounts for the title of the book. It was formerly held that the book was by Josephus, but Freudenthal has shown conclusively that the author was a Hellenistic Jew, probably of Alexandria, who wrote at the beginning of the Christian Era. While of no historical value and marred by exaggerated accounts of the sufferings of Jewish martyrs, it is of great interest because of the picture it affords incidentally of family life among the Jews in the writer's days, as also for some of its doctrines, e.g. that the death of a martyr is an expiatory offering for his people.

A fifth book of the Maccabees is sometimes referred to. It is an Arabic work printed in the Paris and London Polyglots with Latin translation, and contains a history of the Jews beginning with the account of Heliodorus (II. Mac. iii.) and ending with the downfall of the Asmoneans. It is based upon I. and II. Maccabees and Josephus.

BIBLIOGRAPHY. English translations of the books of the Maccabees have been published by Cotton, Bagster, and Churton; there is a French translation by Reuss (in *La Bible*, Paris, 1874 sqq.), and a recent German translation by Kautzsch in *Die Apokryphen und Pseudepigraphen des Alten Testaments* (Tübingen, 1898). There are commentaries by Bissell, Zöckler, Fritzsche, and Grimm. For special treatises, consult: Willrich, *Juden und Griechen* (Göttingen, 1896); Schlatter, *Jason von Cyrene* (Munich, 1891); Niese, *Kritik der beiden Makkabäerbücher* (Berlin, 1900); Freudenthal, *Die Flavius Josephus beigelegte Schrift über die Herrschaft der Vernunft* (Breslau, 1869). Consult, also, the Hebrew histories of Wellhausen, Guthe, and Stade, and Schürer, *History of the Jewish People in the Time of Christ*, vol. i. (Edinburgh, 1896).

MACCABEES, Knights of the. A beneficiary society founded September 1, 1883, and embracing in its features life, accident, sick, and disability benefits. The Supreme Tent, or chief office of the Order, is located at Port Huron, Mich. There are 6 Grand Tents and 4300 Subordinate Tents and Hives, representing a total membership of 310,000 in the Order. The death and disability benefits paid from the date of organization to January 1, 1903, amounted to $14,823,448; those for the fiscal year ending December 1, 1902, being $2,178,124. The surplus on that date was nearly $2,000,000. The Order is incorporated under the laws of the State of Michigan.

MACCABEES, Ladies of the. A fraternal society founded as a social organization in March, 1886, and made a beneficiary society in May, 1890. The central or governing body is known as the Great Hive, and there are 853 subordinate bodies. The total disbursements on account of benefits from 1890 to 1902 were $1,532,709, and during the last fiscal year $256,725 was paid to the beneficiaries of deceased members.

McCALL', George Archibald (1802-68). An American soldier, born in Philadelphia, Pa. He graduated at West Point in 1822, entered the army, and was commissioned a captain in 1836, major in 1847, and colonel in 1850. He served with distinction in the Florida and Mexican wars, was made inspector-general in 1850, and resigned from the army in 1853. In 1861 he took command of the Pennsylvania Reserves, with rank of brigadier-general of volunteers. This force he led through part of the Peninsular campaign of 1862. He was taken prisoner at the battle of Frazier's Farm, June 30, 1862. After several weeks in Libby Prison, he was exchanged, but ill health prevented his return to the army, from which he resigned in March, 1863. He wrote *Letters from the Frontier* (1868).

MacCAR'THY, Denis Florence (1817-82). An Irish poet, born in Dublin. He studied for the Church and afterwards for the bar, but finally gave himself to literary work, and lived principally in London and Dublin. His liking for the Spanish poet Calderon led him to make some most faithful and successful translations of his plays. His original works include: *Ballads, Poems, and Lyrics* (1850); *The Bell-Founder* (1857); *Under-Glimpses* (1857); *The Centenary of Moore* (1880); and *Shelley's Early Life* (1872). He was awarded a medal by the Royal Academy of Spain for his skill in Spanish translation.

McCARTHY, Justin (1830—). An English journalist, politician, and author. He was born at Cork, Ireland, on November 22, 1830. He entered upon the career of journalist at the age of sixteen years by joining the staff of the Cork *Examiner.* This paper he left in 1853 to connect himself with the Liverpool *Northern Times.* Entering the reporters' gallery of the House of Commons in 1860 as a reporter for the *Morning Star,* he became foreign editor of that paper the following year, and editor-in-chief in 1864, remaining in the latter position four years. In 1868 he made a tour of the United States, where he remained three years, a valued contributor to many of the American magazines and for a time editorially connected with the New York *Independent.* On his return he entered into editorial relations with the *Daily News,* at the same time writing regularly for many of the leading English magazines. Entering the House of Commons in 1879, he attained at once a prominent place in the Irish Home-Rule Party, becoming in 1886 vice-president of the Irish National League. In the same year a second but briefer visit was made to America. After the deposition of Parnell from the leadership of the Home-Rule Party in 1890, McCarthy was selected as its Parliamentary chief, retaining the post until 1896. He wrote: *Modern Leaders* (1872); *A History of Our Own Times to 1880* (1879-80); *Epoch of Reform* (1882); *History of the Four Georges* (1884); *The French Revolution* (1890); *A History of Our Own Times from 1880 to 1896* (1897); *Modern England* (1898-99); and *The Story of Gladstone's Life* (1898). The chief source of information concerning McCarthy is his autobiography, published under the title of *Reminiscences* (London and New York, 1899).

McCARTHY, Justin Huntly (1860—). An English dramatist, novelist, and historian, son of the preceding. He was a member of Parliament in 1884-92, and traveled in Europe, Egypt, the Holy Land, and the United States. His numerous publications include: *A History of England Under Gladstone* (1887); a translation of the *Rubáiyát* of Omar Khayyam; and *The French Revolution;* together with the plays: *The White Carnation; The Highwayman; The Wife of Socrates;* and *If I Were King,* with François Villon as hero, presented in the United States by E. H. Sothern.

McCHES'NEY, Clara (1861—). An American genre painter. She was born in Brownsville, Cal., studied art in her native city, and later in the Colarossi School, Paris, under Virgil Williams, under Mowbray and Beckwith in New York, and was also under Courtois and Giradot. She was awarded two medals at the World's Columbian Exposition in 1893, and received the Dodge prize, New York, in 1894. At the Paris Exposition of 1900 she was represented by "The Old Blind Fiddler," and "Pomegranates." At the exhibition of the National Academy of Design, New York, in 1901, she was awarded the second Hallgarten prize for her picture "A Good Story."

MACCHIAVELLI, mă'kyȧ-vĕl'lē, Niccolò. A Florentine writer on political theory. See Machiavelli.

McCLEL'LAN, George Brinton (1826-85). A distinguished soldier in the American Civil War. He was born in Philadelphia, December 3, 1826. He attended the University of Pennsylvania for two years; and graduated at West Point in 1846. He distinguished himself in the Mexican War, and for gallant and meritorious conduct in the battles of Contreras and Churubusco he was brevetted first lieutenant, and for similar conduct at Chapultepec he was brevetted captain. On his return he was appointed to an instructorship at West Point, and while there prepared a *Manual of Bayonet Exercises,* adapted from the French, which became a part of the system of instruction. He was assistant engineer in the construction of Fort

Delaware; was chief engineer in charge of the coast surveys in Texas; collected railroad statistics for the War Department; and was one of the three officers appointed on the military commission to visit the seat of war in the Crimea and report upon the condition of the European armies. On his return in 1857 he resigned his commission, and became successively chief engineer and vice-president of the Illinois Central Railroad, and president of the Saint Louis and Cincinnati Railroad. At the opening of the Civil War he was appointed to the position of major-general of the Ohio volunteers, and made a successful campaign in what later became West Virginia, driving out the enemy and capturing 1000 prisoners. For this he received the thanks of Congress, and after the first disaster to the Federals, at Bull Run, was placed in command of the Army of the Potomac. Upon the retirement of Lieutenant-General Scott in November, 1861, he was appointed commander of the armies of the United States. He spent the winter in reorganizing and drilling his forces, and in March, 1862, he removed to the Yorktown Peninsula in order to attack Richmond from that base.

President Lincoln was continually insisting upon a forward movement, but instead of following his advice, McClellan sat down before Yorktown and began a scientific siege of the place. After its evacuation by the Confederates and the engagement at Williamsburg, McClellan moved leisurely up the Peninsula only to be subjected to a great disappointment in the dispatch of McDowell's 40,000 men to the Shenandoah—an army upon whose aid McClellan had confidently counted. Then followed various engagements ending with the Seven Days' battles (q.v.), in which the Federal armies were generally successful, although the loss in men was large and Richmond was still untaken. There was dissatisfaction at Washington with the result, and in July McClellan was superseded by Halleck as General-in-chief. He was then ordered to evacuate the Peninsula and go to the aid of General Pope, then in command of the Army of Virginia, but arrived too late to be of any great assistance. After the disastrous campaign of Pope, culminating in his defeat in the second battle of Bull Run, McClellan was again placed in active command of the Army of the Potomac. Organizing his army as he proceeded, he followed Lee into Maryland, and with him fought the battle of Antietam (q.v.), September 16-17, 1862. This, though tactically a drawn battle, was strategically a Federal victory; but in view of the great disparity between the numerical strength of the two armies and of McClellan's failure vigorously to pursue Lee's retreating army, the result was not satisfactory to the Government, and in November he was superseded in his command by General Burnside. After this he took no further part in the war. McClellan always asserted that the Administration at Washington not only refused to coöperate with him in his military operations, but even attempted to discredit him on account of his political opinions. The President and the Secretary of War, on the other hand, insisted that General McClellan was not aggressive and prompt enough in the circumstances, but too often pursued a dilatory policy, which caused him to win only fruitless victories, and that he disregarded the advice and suggestions of the commander-in-chief. General McClellan was remarkably popular with his soldiers, over whom he exerted a wonderful influence, and who affectionately called him 'Little Mac.' In 1864 he was nominated by the Democratic Party as its candidate for President of the United States on a platform which denounced the war as a failure. To this view, however, McClellan did not subscribe, and in his letter of acceptance he advocated a vigorous prosecution of the war. He was defeated by Lincoln. In the Electoral College the vote stood 212 for Lincoln and 21 for McClellan, while the popular vote for Lincoln was 2,200,000 and for McClellan 1,800,000. Already in September he had resigned from the army, and after the election went to Europe, where he remained until 1868. Upon his return he settled in New York, where he was engaged in various engineering enterprises until 1877, when he was elected Governor of New Jersey, having in the meantime acquired a residence in that State. He served with credit for one term, but declined a renomination. He died suddenly of heart disease at his home in Orange, N. J., October 29, 1885, and was buried at Trenton. As a scientific engineer and military tactician, McClellan had few superiors. Among his literary works may be mentioned an autobiography entitled *McClellan's Own Story,* and various reports on military campaigns and military organization. The most recent and thorough biography of General McClellan is that of Michie (New York, 1901), in the "Great Commanders Series." Consult also: Rhodes, *The First Six Weeks of McClellan's Peninsular Campaign,* published by the Massachusetts Historical Society; and Ropes, *Story of the Civil War,* vol. ii. (New York, 1895).

McCLENACHAN, ma-klĕn'ȧ-kan, CHARLES THOMPSON (1829—). An American lawyer, born in Washington, D. C. He graduated at Germantown College, and from 1845 to 1850 was an instructor in the New York Institute for the Blind. In 1850-61 he was clerk of the board of councilmen of New York City, during the Civil War was quartermaster of the Seventh New York Regiment, and in 1867 was admitted to the bar. For many years he was successively connected with the street and public works departments of his native city. His works include: *The Laws of the Fire Department* (1855); *The Atlantic Telegraph Cable of 1858* (1863); and *The Book of the Ancient Accepted Rite of Scottish Freemasonry.*

McCLER'NAND, JOHN ALEXANDER (1812-1900). An American soldier on the Federal side prominent in the Civil War. He was born in Breckenridge County, Ky., was brought up in Southern Illinois, and in 1832 was admitted to the bar. In 1833, after having served as a private in the Black Hawk War, he resumed the practice of his profession, and also engaged in mercantile pursuits. In 1835 he became the editor and publisher of the Shawneetown (Ill.) *Democrat.* From 1836 until 1842 he represented his district in the State Legislature; and from 1843 to 1851 he was a Democratic member of Congress from Illinois. In 1851 he removed from Shawneetown to Jacksonville, and in 1859 became again a Representative in Congress. At the outbreak of the Civil War, having been appointed brigadier-general on May 17, 1861, he raised, largely through his personal influence, the McClernand brigade. This he commanded at the battle of Belmont. In February, 1862, he gallantly led his command in the attack on Fort Donelson; was promoted in the following March to be a major-general of volunteers; and commanded a division, April 6th and 7th, at the battle of Shiloh (q.v.). On January 4, 1863, he superseded Gen. W. T. Sherman in the command of the expedition against Vicksburg (the latter general retaining the command of his own corps, the Fifteenth), but was soon afterwards relieved by General Grant. His division having been combined with the naval forces under Admiral Porter (January 11th), he commanded the expedition that finally carried by storm the garrison village of Arkansas Post. He also distinguished himself in the battles of Port Gibson, Champion Hill, Big Black River, and Baker's Creek. In July, 1863, he was relieved of the command of the Thirteenth Army Corps, and on November 30, 1864, he resigned from the service and retired to private life, resuming the practice of the law at Springfield, Ill.

MACCLESFIELD, măk'k'lz-fēld. A manufacturing town in Cheshire, England, on the river Bollin, 15 miles southeast of Manchester (Map: England, D 3). Notable buildings are the Church of Saint Michael's, founded in 1278; a grammar school endowed in 1502; the town hall, and infirmary. It is an active municipality and owns water and gas works, markets, quarries, cemetery, two parks, and bath, and maintains a free library and technical schools. Silks and other textiles are manufactured, and bleaching is an important industry. In the vicinity, coal, slate, and stone are obtained. Macclesfield was a portion of the Mercian royal demesne; it became a borough in 1261 and was incorporated in 1678. Population, in 1891, 36,000; in 1901, 34,600.

McCLIN'TOCK, Sir Francis Leopold (1819—). An English naval officer and explorer. He was born in Ireland, entered the navy in 1831, and in 1838 went to South America in the steamship *Gorgon.* He was attached to the Pacific squadron, in 1848 was a member of the Arctic expedition under Sir James C. Ross, and in 1850 was first lieutenant of the *Resistance* in the Arctic expedition for the relief of Sir John Franklin. On his return to England he was made commander, and in 1852 served under Sir Edward Belcher in a third Arctic expedition. He succeeded in rescuing Captain McClure near Melville Island (1854), but was afterwards obliged to abandon his own vessel. In 1857, in command of the *Fox*, fitted out by Lady Franklin, he started on a new search for Sir John Franklin, and made the first discovery of the explorer's death on the northwestern coast of King William Land. On his return in 1859 he was knighted, and received the degree of doctor of laws from the universities of Oxford, Cambridge, and Dublin. He was made a rear-admiral in 1871 and a vice-admiral in 1877; was in command of the North American and West Indian station from 1879 to 1882; was promoted to be full admiral in 1884; and in 1887 received an admiral's pension. He published *Voyage of the Fox in the Arctic Seas* (1859).

McCLINTOCK, John (1814-70). A Methodist Episcopal theologian. He was born in Philadelphia, October 27, 1814, and graduated at the University of Pennsylvania in 1835. He was ordained a minister of the Methodist Episcopal Church, and acted as professor of mathematics and of Greek and Latin in Dickinson College from 1836 to 1846. In 1848 he was elected by the General Conference editor of the *Methodist Quarterly Review,* retaining the position for eight years. In 1856 he was appointed, with Bishop Simpson, a delegate to the Wesleyan Methodist Conference of England, and to the meeting of the Evangelical Alliance held at Berlin. In 1857 he became pastor of Saint Paul's Methodist Church in New York, and in 1860 was preacher in the American Chapel in Paris. During the Civil War he advocated with ability the Union cause, and his home in Paris was a rallying centre for patriotic Americans. Returning to America in 1864, he was again, for a short time, placed in charge of Saint Paul's Church in New York. His health failing, he resigned in 1865, and resided in Germantown, Pa. In 1866 he removed to New Brunswick, N. J., supplying for a time Saint James's Church, and was made chairman of the Central Centenary Committee of the Methodist Episcopal Church. In 1867 he became president of Drew Theological Seminary, Madison, N. J., and held the position till his death there, March 4, 1870. Besides numerous articles in periodicals, he published a translation of Neander's *Life of Christ* (1847); *Sketches of Eminent Methodist Ministers* (1863); *The Temporal Power of the Pope;* a translation of Bungener's *History of the Council of Trent* (1851); and prepared, in collaboration with Dr. Blumenthal, *Analysis of Watson's Theological Institutes* (1850). In the last twenty years of his life he labored in preparing the *Cyclopædia of Biblical, Theological, and Ecclesiastical Literature,* in connection with Dr. James Strong. At the time of his death three volumes had been published; the work was continued by Dr. Strong and finished in 1887. (12 vols.). A volume of Dr. McClintock's sermons, entitled *Living Words* (1871), and *Lectures on Theological Encyclopædia and Methodology* (1873) were published after his death. Consult his *Life* by Crooks (New York, 1876).

McCLOS'KEY, John (1810-85). An American Roman Catholic prelate. He was born in Brooklyn, was educated at Mount Saint Mary's College, Emmitsburg, Md., and made his theological studies there, in Rome, and in France. He was ordained to the priesthood in 1834, and on his return from Europe became pastor of Saint Joseph's Church, New York. In 1841 he was made the first president of Saint John's College, Fordham, N. Y., but returned to parochial work in the next year. He was appointed coadjutor to Bishop Hughes of New York in 1844, and was consecrated Bishop of Axieren *in partibus.* In 1847 he was appointed the first Bishop of the new Diocese of Albany. He administered the affairs of his see with distinguished ability; built the cathedral at Albany, founded the theological seminary at Troy, erected many churches, established charitable and religious institutions, and introduced monastic orders and lay communities. In July, 1864, he succeeded Dr. Hughes as Archbishop of New York, where his administration was marked by similar energy and resultant growth of the Church and its institutions. In 1875 he was made a cardinal. At the Vatican Council of 1869-70 he was a member of the committee on discipline. Cardinal McCloskey was a profound scholar and an effective preacher. He was a sagacious administrator, of great executive ability and a quiet impressive manner.

McCLURE, ma-klo͞or′, ALEXANDER KELLY (1828—). An American journalist. He was born at Sherman's Valley, Perry County, Pa., and after receiving a good elementary education was apprenticed to a tanner at the age of fifteen. While at work at his trade he began contributing to the columns of the Perry *Freeman*. When scarcely nineteen (in 1846) he began, and, with the aid of a single assistant, continued the publication of the Juniata *Sentinel*, a Whig paper, at Mifflin, Pa. In 1850 he bought an interest in the Chambersburg *Repository*, which, under his management, became one of the most influential anti-slavery papers in the region. In 1853 he was the unsuccessful Whig candidate for Auditor-General, in 1855 was State superintendent of printing, and in the same year was a member of the State convention that met at Pittsburg to organize the new Republican party in Pennsylvania. In 1856 he was a delegate to the first National Republican Convention at Philadelphia, and in the same year left newspaper work and was admitted to the bar. In 1857-58 he was a Republican member of the State Legislature, and in 1859 was elected to the State Senate. In the Republican National Convention of 1860 he led the Pennsylvania delegates who deserted Simon Cameron for Lincoln, and afterward, as chairman of the State Committee, carried Pennsylvania for the latter. In 1862, as a special assistant adjutant-general, he had charge of the draft in Pennsylvania, and in 1864 he was reëlected to the State Legislature. In 1872 he led the Liberal Republican revolt in Pennsylvania, was chairman of that faction's Campaign Committee, and was elected as an independent to the State Senate. He was defeated as independent candidate for Mayor of Philadelphia in 1873 by scarcely 900 votes. He retired from active politics in 1875 and established the Philadelphia *Times*, of which he was editor until 1901. His publications include: *Three Thousand Miles Through the Rocky Mountains; Our Presidents and How We Make Them* (1901); *Recollections of Half a Century* (1902).

McCLURE, ALEXANDER WILSON (1808-65). An American clergyman. He was born in Boston, was educated at Amherst College and at Andover Theological Seminary. Having filled pastorates of various Congregational churches and of the First Reformed Church, Jersey City, he became in 1855 corresponding secretary of the American and Foreign Christian Union, and in 1856 chaplain of that society in Rome, Italy. The American Chapel in Paris was erected with funds obtained by him. He was editor of the *Christian Observatory* and also contributed to the *New Brunswick Review* and the *Literary and Theological Review*. He published a number of controversial works and *The Translators Reviewed*, giving biographical sketches of the translators of the King James Version (1853).

McCLURE, Sir ROBERT JOHN LE MESURIER (1807-73). An English Arctic explorer, who was first to pass through the Northwest Passage. He was born at Wexford, Ireland, studied at Eton and Sandhurst, and in 1824 entered the navy. In 1836-37 he was mate in the Arctic expedition of H.M.S. *Terror*, Captain Back, and in 1837 received his commission as a lieutenant. From 1842 to 1846 he was in command of the *Romney*, receiving-ship at Havana. He joined Sir James C. Ross's first expedition in search of Franklin in 1848, and upon its return in 1849 was promoted to the rank of commander. Almost immediately upon his return from the first expedition it was decided to dispatch the same two vessels, the *Enterprise* and the *Investigator*, upon a second expedition which should proceed by way of Bering Strait. McClure was appointed to the command of the *Investigator*, with Captain Collins, commanding the *Enterprise*, as senior officer of the expedition. The *Investigator*, with a crew of sixty-six, was provisioned for three years. On January 20, 1850, the vessels set sail, but on April 16th were separated by a gale. The *Investigator* continued northward, and became finally fixed in the ice of Prince of Wales's Strait, in latitude 72° 50′ N., and longitude 117° 55′ W. The winter of 1850-55 was passed on the northern shore of Banks Land, in a bay named by McClure the Bay of Mercy. Here the ship remained blocked throughout 1852, but on April 6, 1853, was reached from Melville Island by Lieutenant Pim of the *Resolute*. The season was again unfavorable, and a fourth winter was spent in the Arctic. At last, in the spring of 1854, McClure and his crew were rescued by McClintock, who had come from the opposite direction, and in September they arrived in England, although not in their own ship, having accomplished the traverse of the Northwest Passage, the discovery of which had been a great goal of Arctic exploration. McClure was promoted to be captain, was knighted, and was appointed to command the *Esk* of the Pacific Squadron. He returned in 1861, in 1867 was promoted to be rear-admiral, and in 1873 was appointed vice-admiral on the retired list. The honor of having first discovered the Northwest Passage has been claimed by many for Sir John Franklin.

McCLURG, ALEXANDER CALDWELL (1835-1901). An American publisher, born in Philadelphia. He graduated at Miami University, Oxford, Ohio, in 1853, and became associated with the publishing firm of S. C. Griggs & Co. at Chicago. In 1862 he entered the Union Army as a captain in the Eighty-eighth Illinois Volunteer Infantry, was made a colonel and brevet brigadier-general, and served through the Atlanta campaign and Sherman's march to the sea as chief of staff of the Fourteenth Army Corps. After the war he became a partner in the Griggs publishing house, and after a few years organized the firm of Jansen, McClurg & Co., later A. C. McClurg & Co., which became one of the most prosperous publishing houses in America. In 1899, after the destruction of the establishment by fire, he reorganized the company on the basis of industrial coöperation, distributed much of the stock to the employees, and permitted them to buy more on easy terms.

McCLY′MONT, JAMES ALEXANDER (1848—). An English biblical scholar, born at Girvan, Ayrshire, and educated at Girvan Grammar School, at Ayr Academy, Edinburgh University, and Tübingen. In 1874 he became minister of Holburn Parish, Aberdeen, and he served as a member of the general committee of the Church of Scotland. He was one of the translators of Beck's *Pastoral Theology of the New Testament;* and wrote: *The New Testament and Its Writers* (1892); a volume in the *Century Bible* on Saint

John's Gospel; and *The Church of Scotland* (1893).

MacCOLL′, Evan (1808-98). A Canadian Gaelic poet, born at Kenmore, Scotland. His principal work, *Clàreach nam Beann: or Poems and Songs in Gaelic* (1838), was printed in English the same year under the title *The Mountain Minstrel*, of which five subsequent editions appeared. MacColl went to Canada in 1850, and was employed in the custom house at Kingston, Ontario, for thirty years. In 1880 he retired and went to live in Toronto, where a complete edition of his works was published in 1883. He was a fellow of the Royal Society of Canada from its inauguration.

MacCOLL, Malcolm (1838—). A theologian and author, born March 27, 1838, at Glenfinan, in Inverness-shire, Scotland. He was educated at Trinity College, Glenalmond, and at the University of Naples. He was appointed assistant curate of Saint Paul's, Knightsbridge (1861); chaplain to the British Ambassador at Saint Petersburg (1862-63); curate of Saint Paul's (1864-67); rector of Saint George's, London (1871); and canon of Ripon Cathedral (1884). In 1875 he attended the conference of the Eastern and Western Churches at Bonn. Among his publications are: *Mr. Gladstone and Oxford* (1865); *Science and Prayer* (1866); *Lawlessness, Sacerdotalism, and Ritualism* (1875); *Christianity in Relation to Science and Morals* (1892); *Responsibility of England Toward Armenia* (1895); *The Sultan and the Powers* (1896); and *Life Here and Hereafter* (1896).

McCOMB, m′-kōm′. A town in Pike County, Miss., about 60 miles east by south of Natchez; on the Illinois Central Railroad (Map: Mississippi, E 8). The McComb City Female Institute, opened in 1894, is situated here. McComb is in a productive cotton-growing region, and has cotton mills, and the largest and most completely equipped railroad shops in the State. There are public parks. The water-works are owned by the municipality. Population, in 1890, 2383; in 1900, 4477.

McCON′NELSVILLE. A village and the county-seat of Morgan County, Ohio, 27 miles south by east of Zanesville; on the Muskingum River, and on the Baltimore and Ohio Railroad (Map: Ohio, G 6). It is the centre of a farming region, and among its industrial plants are flouring mills and the Government workshops and yards for the Muskingum River Improvement. Natural gas is found in the vicinity, also coal, the county being one of the greatest coal-producing areas in the State. Population, in 1890, 1771; in 1900, 1825.

McCOOK′. A city and the county-seat of Red Willow County, Neb., 228 miles west by south of Lincoln; on the Republican River and on the Burlington and Missouri River Railroad (Burlington Route) (Map: Nebraska, D 3). It is a railroad division headquarters with shops, and is the centre of a section interested largely in the cultivation of sugar beets and alfalfa, and in cattle-raising. Population, in 1890, 2346; in 1900, 2445.

McCOOK, Alexander McDowell (1831-1903). An American soldier, prominent in the Civil War. He was born in Columbiana County, Ohio, graduated at West Point in 1852, was employed for a time in garrison duty, served against the Utah and Apache Indians in 1855, and from 1858 to 1861 was assistant instructor of infantry tactics at West Point. In the last named year he was appointed colonel of a volunteer regiment, and in this capacity served in the first battle of Bull Run, earning the brevet of major. He was promoted to be brigadier-general of volunteers on September 3d, commanded a brigade in the operations in Kentucky, October-December, 1861, and a division in the Army of the Ohio in the Tennessee and Mississippi campaign, February and June, 1862, and became a major-general of volunteers on July 16, 1862. He led a corps under Buell in Kentucky during that officer's campaign against Bragg, and on October 8th participated in the battle of Perryville. From November to December, 1862, he was in command at Nashville, Tenn., and subsequently participated in the battles of Murfreesboro and Chickamauga; was assigned to the Middle Military Division, and from February to May, 1865, was in command of the District of Eastern Arkansas. At the close of the war he was brevetted brigadier-general in the Regular Army for 'gallant and meritorious services at the battle of Perryville,' and major-general for 'gallant and meritorious services in the field during the Rebellion,' and in March, 1867, reëntered the regular service as lieutenant-colonel. He became a brigadier-general in 1890 and a major-general in 1894, was retired from active service in 1895, represented the United States at the coronation of the Czar in May, 1896, and from September, 1898, to February, 1899, served on a commission appointed by President McKinley to investigate the administration of the War Department during the Spanish-American War. His father and his eight brothers all served as officers in the Federal Army during the Civil War, and his father and three of his brothers were killed.

McCOOK, Anson George (1835—). An American soldier and politician, born at Steubenville, Ohio. At the outbreak of the Civil War he entered the Federal Army as captain in an Ohio regiment; was at the first battle of Bull Run, and later became colonel of a regiment in the Army of the Cumberland. At the close of the war he was brevetted brigadier-general. In 1873 he removed to New York, and was elected as a Republican to Congress, serving from 1877 until 1883. He was secretary of the United States Senate from 1887 to 1893, and city chamberlain of New York from 1893 until 1897.

McCOOK, Henry Christopher (1837—). An American theologian and entomologist, brother of A. G. McCook, born at New Lisbon, Ohio. He was educated at Jefferson College and at the Western Theological Seminary; served as lieutenant and as chaplain in the Forty-first Illinois Volunteers (1861-62); and was then pastor at Clinton, Ill. (1862-63), a home missionary in Saint Louis (1863-70), and pastor of the Tabernacle Presbyterian Church of Philadelphia. He was chaplain of the Pennsylvania commandery of the Loyal Legion, and of the Second Regiment, Pennsylvania Volunteers, in the war with Spain; was long president of the American Entomological Society and vice-president of the Philadelphia Academy of Natural Sciences, as well as president of the American Presbyterian Historical Association. He wrote: *The Women Friends of*

Jesus (1885); *The Gospel in Nature; Object and Outline Teaching* (1871); *The Latimers, a Scotch-Irish Historic Romance of the Western Insurrection* (1898); and the entomological works, *The Mound-Making Ants of the Alleghanies* (1877); *The Agricultural Ants of Texas* (1879); *Honey Ants and Occident Ants* (1882); *American Spiders and their Spinning Work* (1889-93); and *Tenants of an Old Farm* (1884).

McCOR′MICK, Cyrus Hall (1809-84). An American inventor and manufacturer. He was born in Virginia, but removed to Cincinnati in 1845, and to Chicago in 1847. In 1831 he constructed the reaping machine which, subsequently patented and greatly improved, has become celebrated in many lands and won for its inventor wealth, medals, and decorations. In 1859, with a portion of his wealth, he contributed largely to the establishment at Chicago of the Presbyterian Theological Seminary of the Northwest, and afterwards endowed a professor's chair in Washington and Lee University, Lexington, Va.

McCORMICK THEOLOGICAL SEMINARY. A divinity school of the Presbyterian Church, in Chicago, opened in 1830 as the theological department of Hanover Academy at Hanover, Ind. In 1840 it was removed to New Albany, Ind., where it remained until reëstablished at Chicago in 1859 upon an offer of endowment by Cyrus H. McCormick under the name of the Presbyterian Theological Seminary of the Northwest. Its present name was assumed in 1886. The seminary charges no fees for tuition or lodging. Special funds provide assistance for needy students, and fellowships are awarded for excellence. There are six buildings, valued with the grounds at $400,000. The library contains upward of 25,000 volumes. In 1903 the seminary had ten instructors, 120 students, an endowment of $1,000,000, and a gross income of $25,000, the total value of its property being estimated at $1,500,000.

McCOSH′, James (1811-94). A Scottish-American philosopher and educator. He was born in his father's farmhouse at Carskeoch in Ayrshire, April 1, 1811. At the age of thirteen he was sent to Glasgow University, and went thence in 1829 to Edinburgh. Always a philosopher, he had not at first the intention of devoting himself to education. In 1834 he began preaching, and not long after was settled as a minister at Arbroath. In 1839 he removed to a larger charge at Brechin. During his incumbency there he threw himself ardently into the work of setting up the Free Church of Scotland, as a protest against the reception of State aid by the Established Kirk, which the seceders called Erastianism. After the arduous labors of disruption had a little relaxed, he published in 1850 *The Method of the Divine Government, Physical and Moral,* which no less an authority than Sir William Hamilton pronounced "worthy of the highest encomium." This book laid the foundation of his fame as a philosophical writer, and he probably owed to it his appointment in the following year to the chair of logic and metaphysics in the college at Belfast of the newly founded Queen's University, and the beginning of an educational career which was to last till the close of his active life. The eighteen years which he spent at Belfast were, however, by no means exclusively devoted to the teaching of philosophy. He was active in all schemes for good, caring for the spiritual welfare of all who were brought into relation with him, laboring to promote workingmen's clubs and the circulation of the Scriptures and carrying out his anti-Erastian principles by supporting the Irish Presbyterians in the establishment of a sustentation fund. Called back in 1856 to teach apologetics and theology at Glasgow, he resolutely declined, and remained at Belfast until he was invited in 1868 to assume the presidency of Princeton College. On the occasion of a previous visit to the United States he had been impressed with the belief that the American colleges, "while they had not the prestige nor the consolidation of the European ones in such departments as mathematics and classics, had nevertheless a better capacity for development;" and it may have been this which tempted him to leave his work in Ireland. It was a critical period for American higher education. New ideas were abroad, scarcely tested as yet; possibilities were in the air, of splendid promise. No small task was set before a foreigner, well on in middle life, who was expected to evolve a new system, to win public confidence, to regenerate student manners, and to secure the endowments necessary for a work of such magnitude. It was accomplished, however, with remarkable success, as may be inferred from the fact that the number both of students and professors in Princeton College more than doubled during his administration. He resigned the presidency, owing to advancing age, in 1888, but retained the chair of philosophy, and continued to live at Princeton until his death, November 16, 1894. He was an ardent defender of the Scotch philosophy against empiricism, and enlarged its scope by placing much more of our knowledge to the credit of intuition than had his predecessors. His theology was strictly on the lines of the Westminster Confession, but he was one of the first orthodox clergymen to accept and defend the theory of evolution in biology. Among his voluminous works may be mentioned *Typical Forms and Special Ends in Creation,* in collaboration with Dr. Dickie (1856); *Intuitions of the Mind Inductively Investigated* (1860); *The Supernatural in Relation to the Natural* (1862), which was intended to form part of a completer treatment of the method of the divine government, supernatural and spiritual; *An Examination of Mill's Philosophy* (1866); *The Scottish Philosophy, Biographical and Critical* (1874); *The Emotions* (1880); *Psychology of the Cognitive Powers* (1886); *Psychology of the Motive Powers* (1887); and *Realistic Philosophy Defended* (1887). Consult his *Life,* edited by Professor Sloane (New York, 1896).

MacCRACK′EN, Henry Mitchell (1840—). An American clergyman and educator, born in Oxford, Ohio. He graduated at Miami University in 1857, was a teacher and school superintendent for four years, studied at the United Presbyterian Theological Seminary and then at the Princeton Theological Seminary, and held pastorates at Columbus, Ohio (1863-67), and at Toledo, Ohio (1869-81). In 1867 he served as a deputy to the Assembly of the Free Church of Scotland, and of the Presbyterian Church of Ireland, and continued his studies at the universities of Tübingen and Berlin. He was chancellor of the Western University in Pittsburg from 1881 to 1884, was then called to be professor of philosophy and vice-chancellor (under an honorary chancellor) in the University of the City of New York, and in 1891 became chancellor. Under his administration the institution's name was changed to New York University, the seat of the University College and School of Applied Science was removed to University Heights, New York City, the scope of its work extended, and the Hall of Fame for Great Americans (q.v.) was projected and built. Among his writings, besides many essays on philosophical and religious topics, are: *A Metropolitan University* (1892); *Leaders of the Church Universal* (1879); *Popular Sermons* (1875); *John Calvin* (1888).

McCRA'DY, Edward (1833-1903). An American lawyer, soldier, and historian, born in Charleston, S. C. He studied at Charleston College, and in 1855 was admitted to the bar in his native State, where he took an active part in the secession movement and participated in the capture of Castle Pinckney and in the bombardment of Fort Sumter. After the organization of the Confederate Government, he entered its military service as captain of the first company raised in South Carolina (June 27, 1861), and rose to the rank of lieutenant-colonel. He was wounded at the second battle of Bull Run (August 30, 1862), and a few months later was so severely injured by a falling tree as to be incapacitated for further field service. After the war he became a member of the House in his State Legislature, and proposed the South Carolina election and registration law, known as the Eight-Box Law. His principal works are: *The History of South Carolina Under the Proprietary Government, 1670-1719* (1897); *The History of South Carolina Under the Royal Government, 1719-1776* (1899); and *The History of South Carolina in the Revolution, 1775-1780* (1901).

McCRA'RY, George Washington (1835-90). An American politician, born at Evanston, Ind. When he was about a year old his family removed to that part of Wisconsin Territory which later became the State of Iowa. He was admitted to the bar in 1856 and began to practice law at Keokuk. The next year he was elected to the State Legislature, and from 1861 until 1865 he was a member of the State Senate. From 1869 until 1877 he was a Republican member of Congress, where he served on the Committee on Revision of Laws, Naval Affairs, and Judiciary, and was chairman of the committees on Elections and on Railroads and Canals. He drew up the law under which the United States judiciary was reorganized, proposed the appointment of a joint committee to count the electoral vote at the time of the Tilden-Hayes controversy, and was largely instrumental in securing the passage of the Electoral Bill. He was Secretary of War from 1877 to 1879, but in the latter year became judge of the Eighth United States judicial district. He published *The American Law of Elections* (1875).

McCREA, m'-krā', Jane (1753-77). An American girl, who during the Revolutionary War met her death under circumstances which have given her name a place in history. She was born at Bedminster (now Lamington), N. J.; but after the death of her father, a Scotch Presbyterian clergyman, she lived near Fort Edward, N. Y., with her brother, and in July, 1777, at the time of Burgoyne's invasion, was visiting a Mrs. McNeil at this place. Her lover, David Jones, was an officer in a Loyalist regiment, and on the morning of July 27th seems to have sent a small party of Indians (under Duluth) to escort her within the English lines, where the two were to be married. Meanwhile another party of Indians under the Wyandot Panther (or Wolf) captured her and Mrs. McNeil, and was closely pursued and fired upon by a party of Americans. Mrs. McNeil arrived in safety at the English camp, and on the next day a scalp, identified as that of Jane McCrea (whose body was found soon afterwards), was brought in; but the exact manner of her death was never definitely known. The Indians claimed that she was shot accidentally, by the pursuing Americans, but it seems almost certain that she was killed by the Indians themselves, during a dispute over her possession between Panther and Duluth. The story of her death, embellished with many romantic details, spread with wonderful rapidity, and so aroused the surrounding country that volunteers poured in from all sides to assist in the operations against Burgoyne; while Burgoyne himself, shocked at the barbarity of his Indian allies, reproved them with such severity that most of them forthwith left his camp and refused further aid. Many versions of the story have appeared, all accounts, however, agreeing that the unfortunate girl was beautiful and highly accomplished, and a general favorite.

McCULLOCH, m'-kŭl'lō, Benjamin (1811-62). An American soldier, born in Rutherford County, Tenn. He left school at the age of fourteen to become a hunter and river boatman; joined David Crockett (q.v.) and other adventurous frontiersmen in 1835 as a volunteer in the Texan war of independence, and served with distinction in the battle of San Jacinto. After the war he settled at Gonzales as a surveyor, and in 1839 was elected a member of the Texan Congress. In 1840-41 he was engaged in fighting the Comanches, and in repelling Mexican border raids. He was a member of the first Texas State Legislature, and was appointed a major-general of the State militia. In the Mexican War, he recruited a picked force of Texan mounted rangers, served under Taylor at Monterey and Buena Vista, and later performed valuable scouting duty during Scott's advance on the Mexican capital. After a few years' residence in California, he returned to Texas in 1852, and in the following year was appointed to the difficult and dangerous post of United States marshal for Texas. In 1857 he was one of the commissioners to settle the difficulties with the Mormons in Utah. At the outbreak of the Civil War he entered the Confederate service, and was appointed, in May, 1861, brigadier-general, and placed in command of the Indian Territory. He had scarcely organized his command, when he was ordered with it into Missouri to carry out the plan of winning that State for the Confederacy. He joined General Sterling Price, and with him defeated the Federal forces under Gen. Nathaniel Lyon (q.v.) at Wilson's Creek, August 10, 1861. After the battle he refused to order a pursuit of the Federal troops, and was superseded in the chief command by General Price. He continued in active service, however, commanded one of the Confederate wings under Gen. Earl Van Dorn (q.v.) at the battle of Pea Ridge, Ark. (q.v.), March 7-8, 1862, and was killed by a sharpshooter while reconnoitring. Consult Reid, *Scouting Expeditions of McCulloch's Rangers* (Philadelphia, 1850); and Rose, *Life and Services of Gen. Benjamin McCulloch.*

MACCULLOCH, m'-kŭl'lō, HORATIO (1805-67). A Scotch painter, born at Glasgow. He studied under John Knox, a landscape painter, in his native city, and exhibited for many years at the Royal Academy, Edinburgh. He was elected an academician in 1838, and after 1847 lived in Edinburgh. His works are usually studies of Highland scenery, painted with great breadth, freshness, and sincerity. They include: "Evening;" "A Lowland River;" "Inverlochy Castle;" and "My Heart in the Highlands."

McCULLOCH, HUGH (1808-95). An American financier, born at Kennebunkport, Me. He studied at Bowdoin College, but on account of ill health did not graduate. In 1833 he removed to Fort Wayne, Ind., and entered upon the practice of law, but in 1845 he accepted the position of manager of a branch of the State Bank of Indiana, and soon became one of the directors of the mother bank as well. In 1862 he was made president of the Bank of the State of Indiana, which had been just organized. In these positions he gained a more than local reputation as a skilled financier. In 1863 he was appointed Comptroller of the Currency, with supervision over the national banking system, which was called into existence by the law of that year. In March, 1865, McCulloch succeeded Fessenden as Secretary of the Treasury at the request of President Lincoln, and held that position until March, 1869. Here he was confronted with the serious problems of paying off the troops and bringing order into the finances of the nation, overcharged with the issue of all kinds of obligations of indebtedness. In the former task he was highly successful; in the latter he made good progress in getting the funded indebtedness in order, but after a brief period of approval met with antagonism in Congress in his efforts to retire the legal-tender notes. McCulloch was an earnest advocate of specie resumption at the earliest possible moment. In 1869 he retired from the Treasury, became a member of the firm of Jay Cooke, McCulloch & Co., London, and engaged in banking in that city. He was reappointed Secretary of the Treasury upon the retirement of Secretary Gresham in October, 1884, and held that office until 1885. He died in 1895. He was the author of a pleasing book of recollections, entitled *Men and Measures of Half a Century.*

MACCULLOCH, JOHN (1773-1835). An eminent English geologist, born in Guernsey, of a Scottish family. He studied medicine in Edinburgh, and was appointed assistant surgeon to an artillery regiment. He became chemist to the Board of Ordnance in 1803, and for some time practiced medicine. In 1811, employed by the Government, he devoted himself to a pioneer geological and mineralogical exploration of Scotland. The brilliant results of his labors appeared in *A Description of the Western Isles of Scotland* (1819); further, in his *Highlands and Western Isles of Scotland* (1824), and the *Geological Map of Scotland,* with an explanatory volume (1836). His scientific work has well earned for him a conspicuous position in the history of British geology. He was chiefly interested in petrography and mineralogy, and appears to have been irritated by the increasing prominence of paleontological geology.

McCULLOCH, JOHN RAMSEY (1789-1864). A British economist and statistician. He was educated at Edinburgh, with a view to fitting himself for the legal profession, and entered the office of a solicitor; but, finding the work distasteful to him, he devoted himself to the study of economics. His first publication, *An Essay on a Reduction of the Interest of the National Debt,* appeared in 1816. From 1817 to 1827 he contributed numerous articles on economics to the *Scotsman,* a periodical which had recently been founded in the interests of liberalism. In 1818 he began to write for the *Edinburgh Review,* and for twenty years contributed almost all of the articles on economic subjects that appeared in that periodical. In 1824-25 appeared his first important work, *A Discourse on the Rise, Progress, Peculiar Objects and Importance of Political Economy.* In 1825 he published his *Principles of Political Economy.* In the following year he published an *Essay on the Circumstances which Determine the Rate of Wages and the Condition of the Laboring Classes,* a work which is of great importance in the history of the 'Wage-Fund Theory.' In 1828 McCulloch was appointed to the chair of political economy in University College, London, but he found the position unsatisfactory and resigned in 1832. In 1831 he published a work on the *Principles, Practice and History of Commerce,* which had great influence in popularizing the doctrines of free trade. The following year what is perhaps his greatest work appeared, *A Dictionary, Practical, Theoretical and Historical, of Commerce and Commercial Navigation.* In 1838 he was appointed Comptroller of the Stationery Office, a position which he held until his death. In 1845 appeared his *Treatise on the Principles and Practical Influence of Taxation and the Funding System,* a work once regarded as of great importance in the science of finance. He also edited a large number of pamphlets of early writers in economics, thus giving a great impulse to the study of the history of the science. He also published copiously annotated editions of Adam Smith and Ricardo. From the death of Ricardo until the rise of Mill to fame. McCulloch was the predominant personality of English economics. His work was not always accurate, and never original; but he did more than any writer of his time to create a popular interest in economics; by his dogmatism, however, and the harshness with which he asserted the superiority of economic law to well-meant political institutions, he aroused among more humanitarian thinkers an intense dislike for economic science. Consult biographical notice by Reid in the new edition (London, 1869) of McCulloch's *Dictionary of Commerce and Commercial Navigation.* Consult also the article "McCulloch" in Palgrave's *Dictionary of Political Economy.*

McCULLOUGH, m'-kŭl'lō, JOHN EDWARD (1837-85). An American tragedian, born at Blakes, Londonderry, Ireland. He came to the United States from Ireland in 1853, and first appeared on the stage in a minor part at the Arch Street Theatre, Philadelphia, in 1857. In 1866-68 he traveled with Edwin Forrest, whose methods he imitated. Forrest intended McCullough to be his dramatic successor, but any realization of this was made impossible by the latter's lack of originality and literary training. In 1881 McCullough appeared for a month's run in the parts of Othello and Virginius, at Drury Lane, London, but failed to make a favorable impression on his English audiences. He took many notable rôles, including Laertes, Iago, Edgar, Macduff, Richmond, Cominius (to Forrest's Coriolanus), Pythias (to Forrest's Damon), Hamlet, Richelieu, Falconbridge, Pierre (in Otway's *Venice Preserved*), De Mauprat (to Edwin Booth's Richelieu), Richmond (to Edwin Booth's Richard III.), Spartacus, Rolla (in *Pizarro*), and Lucius Brutus (in *The Fall of Tarquin*). His chief part, however, was Virginius, in which, indeed, he was unrivaled during his time. His interpretations were of the heroic type.

MacCUNN', Hamish (1868—). A Scotch composer, born in Greenock. He studied at the Royal College of Music, London, and under Hubert Parry. He was introduced to the musical world in 1887 by August Manns, and the next year became professor of harmony at the Royal Academy of Music. In 1892 he was conductor of the Hampstead Conservatory Orchestra Society. In 1894 he resigned his professorship. His compositions are full of life and color and have been received with universal popularity. They include the operas *Jeanie Deans* (1894); *Diarmid and Ghriné* (1897); the cantatas, *Bonnie Kilmeny* (1888); *Lord Ullin's Daughter* (1888); *The Lay of the Last Minstrel* (1888); *The Cameronian's Dream* (1892); *The Death of Parry Reed;* the orchestral overtures, *The Land of the Mountain and the Flood; Cior Mohr; The Dowie Dens o' Yarrow;* and numerous songs and instrumental pieces.

McCURDY, James Frederick (1847—). A Canadian Orientalist, born at Chatham, New Brunswick. He was educated at the University of New Brunswick, under William Henry Green at the Princeton Theological Seminary, where he was instructor in Semitic languages (1873-82), and at Göttingen and Leipzig (1882-84), was Stone lecturer at Princeton (1885-86), and then became professor of Oriental languages in the University of Toronto. For the American edition of Lange's *Commentary* he translated and edited the parts dealing with the Psalms and Hosea, and himself wrote the commentary on Haggai (1872-74). His other works include: *Aryo-Semitic Speech* (1881); "The Semitic Perfect in Assyrian," in the *Proceedings* of the Sixth Oriental Congress (1885); *History, Prophecy and the Monuments* (1894-1901); and *The Life and Work of the Rev. D. J. Macdonnell* (1897).

McDANIEL, măk-dăn'yĕl, Henry Dickerson (1837—). An American lawyer and politician, born in Monroe, Ga. He graduated at Mercer University (Macon, Ga.) in 1856, and was admitted to the bar; was a member of the Secession convention of Georgia in 1861, and on the outbreak of the Civil War entered the Confederate Army, in which he rose to the rank of major in the Eleventh Georgia Infantry. In 1865 he was a member of the State constitutional convention, in 1873-74 of the State Legislature, in 1874-83 was State Senator, and from 1883 to 1886, as a Democrat, was Governor of Georgia. Subsequently he acquired interests in oil and cotton-milling in Walton County, Ga.

MACDONALD, mȧk'dô'năl', Etienne Jacques Joseph Alexandre, Duke of Taranto (1765-1840). A marshal and peer of France. He was born at Sedan of a Scotch family, entered the army in 1785, embraced the cause of the Revolution, served under Dumouriez and Pichegru, and became general of division in 1796. In 1798 he was Governor of the Roman Republic, and the next year was defeated at the Trebbia by an overwhelming force under Suvaroff, redeeming himself, however, in 1800 and 1801 by his bold march through Switzerland. Though he had aided Napoleon on the Eighteenth Brumaire, he lost the favor of the First Consul in 1804 through the sympathy he displayed for Moreau (q.v.). Restored to favor in 1809, he commanded under Eugène Beauharnais, took Laibach, won the battle of the Raab, and with Lauriston (q.v.) broke the Austrian centre at Wagram, gaining the title of duke and marshal. He fought in Spain in 1810, in Russia in 1812, at Lützen and Bautzen in 1813, was crushed by Blücher at the Katzbach, and in the same year led the rear-guard in the retreat from Leipzig. He shared in the campaign of 1814 in France. The Bourbons made him a peer and he remained faithful to them during the Hundred Days, for which after the Second Restoration he was loaded with honors and gifts. The *Souvenirs du maréchal Macdonald, duc de Tarente,* were published at Paris in 1892.

MACDON'ALD, Flora (1722-90). A Scottish celebrity. She was born at Milton, in the island of South Uist, one of the Hebrides, and became famous in connection with the escape of the Jacobite Pretender in 1746. When the Pretender, Charles Edward Stuart, after the battle of Culloden, fled and was pursued by the King's troops, he was rescued by the exertions of Flora, and, disguised as her female servant, was conducted by her to the Isle of Skye. When the act of Flora became known she was arrested, and, after being kept five months on various vessels of war, she was sent to London, but was soon discharged under the Indemnity Act of 1747. In 1750 she returned to Scotland, and was married to Allan Macdonald of Kingsburgh. They emigrated to America in 1774, and settled in Fayetteville, N. C. In the Revolutionary War Macdonald took the part of the British, and served in the army as brigadier-general. Flora returned to Europe alone. Her husband, after capture and imprisonment at Halifax, Va., rejoined her in Scotland. She died at Peinduin. Consult: Macgregor (afterwards MacKenzie), *Flora Macdonald and Her Adventures with Prince Charles* (Inverness, 1882); Jolly, *Flora Macdonald in Uist* (Perth, 1886).

MACDONALD, George (1824-1905). A Scottish novelist, born at Huntley, Aberdeenshire, and educated at Aberdeen University. He studied for the ministry at the Independent College, Highbury, London; preached at Arundel in Sussex, and at Manchester, but retired from the ministry owing to ill health. In 1872-73 he visited the United States on a lecturing tour. He began his literary career as poet, publishing volumes of poems in 1856, 1857, and 1858. His later verse comprises *The Gifts of the Child Christ and Other Poems* (1882), and *Rampolli,* translations from the German (1897). In 1862 appeared *David Elginbrod*, a novel in the dialect of Aberdeen, which was followed by *The Portent* (1864); *Alec Forbes of Howglen* (1865); *Annals of a Quiet Neighbourhood* (1866); *The Seaboard Parish* (1868); *Robert Falconer* (1868); *Wilfrid Cumbermede* (1871); *Malcolm* (1874); *Thomas Wingfold, Curate* (1876); *The Marquis of Lossie* (1877); *Sir Gibbie* (1879); *What's Mine's Mine* (1886); *Lilith* (1895); *Salted with Fire* (1897), and several others. These Scotch novels, rather poorly constructed, but excellent in tone, were widely popular. They are historically the connecting link between John Galt (q.v.) and the school of J. M. Barrie (q.v.). Macdonald also wrote several books especially for the young, as *Dealings with the Fairies* (1867), *At the Back of the North Wind* (1870), and *The Princess and the Goblin* (1871). Among his religious works are *Unspoken Sermons* (1866-69), and *The Miracles of Our Lord* (1870).

MACDONALD, Sir HECTOR (1853-1903). A British general, born in Scotland, the son of a laboring man. He enlisted in the 92d Gordon Highlanders in 1870, served nine years in the ranks, and in 1880 for bravery in the Afghan War was gazetted second lieutenant. He served in the Kabul and Kandahar campaign, in the Boer War of 1881, where, thanks to the admiration roused by his bravery, he was captured alive at Majuba Hill, and distinguished himself at Suakim in 1888 and in the Nile campaign of 1889. In 1897, after commanding a brigade in the Dongola expeditionary force, he was put at the head of the Egyptian brigade and took a prominent part at Abu-Hamed, at Atbara, and at Khartum. He was appointed aide-de-camp to the Queen, and after Magersfontein was ordered from the Sirhind district in India to the command of the Highland Brigade, which he successfully reorganized. Macdonald was promoted K.C.B. in 1900, and was a member of the Distinguished Service Order. Transferred in 1901 from the southern and Belgaum district in India to Ceylon, he was suddenly summoned home to meet a charge of immoral conduct, and committed suicide in a Paris hotel on March 25, 1903.

MacDONALD, JAMES WILSON ALEXANDER (1824—). An American sculptor, born in Steubenville, Ohio. He studied in Saint Louis under Waugh and in New York City in 1849. His first ideal works were "Joan of Arc" and "Italia." His portrait statues include those of Edward Bates (1876) in Forest Park, Saint Louis; of Fitz-Greene Halleck, in Central Park, New York City (1877); of General Custer at West Point; and he also made busts of Washington (in Prospect Park, Brooklyn) and of Bryant, Cooper, and Weed. He prepared other busts of Washington from Houdin's original model, which he owned. He was an author and lecturer in art.

MACDONALD, Sir JOHN ALEXANDER (1815-91). A Canadian statesman. He was born in Glasgow, Scotland, January 11, 1815. With his parents he emigrated in childhood to Canada, was educated at Kingston Grammar School, studied law, and was called to the bar in 1836. He was returned to Parliament in 1844 as Conservative member for Kingston, Ontario, and soon distinguished himself by forcible oratory and self-control. In 1847 he became a member of the Executive Council and Receiver-General, and in 1854 entered a coalition Cabinet as Attorney-General for Upper Canada, holding office till 1862, when the Ministry resigned, upon the defeat of the Militia Bill that he had introduced to place Canada on a self-defensive basis. In 1864 he entered the Cabinet of Sir E. P. Tache as Attorney-General. A coalition was now formed between the leaders of the Government and the opposition on the bill to unite all British America under a federal government, a project which had been facilitated by the unauthorized part that Macdonald had taken in the incipient conference, earlier in the same year, at Charlottetown, P. E. I. On the establishment of the Dominion of Canada (q.v.) in 1867, Macdonald was called upon to form the first Government, and was made Minister of Justice and Attorney-General. The Cabinet resigned in 1873. He was instrumental in securing the construction of the Intercolonial and Pacific railways, as a contingent to the federation policy. In 1870 he was one of the British commissioners appointed to settle the Alabama claims and other difficulties between the British Government and the United States, and was one of the signers of the Treaty of Washington in 1871. The protection of native industries constituted a successful election platform in 1878, when he formed another Cabinet, taking himself the post of Minister of the Interior, which he filled for several years afterwards, holding various Government positions. He was equally successful in the elections of 1882, 1887, and 1891, in the last of which he made a strong attack upon reciprocity with the United States. He died at Earnscliffe Hall, near Ottawa, on June 6, 1891. Consult: Macpherson, *Life of Sir John Macdonald* (Toronto, 1892); Collins, *Life and Career of Sir John Macdonald* (Toronto, 1891); Pope, *Memoirs of Sir John Alexander Macdonald* (London, 1894).

McDONALD, JOHN SANDFIELD (1812-72). A Canadian statesman, born at Saint Raphaels, Glengarry. He was admitted to the bar in 1840, and in 1841 was elected to the Parliament of the United Provinces. In 1843, 1848, 1852, and 1854 he was reëlected, and from 1849 to 1851 was Solicitor-General. From 1852 to 1854 he was Speaker of Parliament, in 1857 sat in Parliament for Cornwall, and was from 1862 to 1864 Premier under Lord Monk. In 1867 he became Premier of Ontario Province, and in 1871 resigned. He was extremely independent in all phases of political affairs.

McDONALD, JOSEPH EWING (1819-91). An American politician. He was born in Butler County, Ohio, and was educated at Wabash College, Crawfordsville, Ind., and at Asbury (now De Pauw) University. He studied law, was admitted to the bar in 1844, and in the following year established himself in practice in Crawfordsville, where from 1845 to 1847 he was county prosecuting attorney. In 1848 he was elected to Congress as a Democrat, but in 1850 was defeated for reëlection. He was Attorney-General of Indiana from 1856 to 1860, and afterwards practiced privately in Indianapolis. In 1864 he was the Democratic candidate for Governor, but was defeated by Oliver P. Morton. In 1872 he became chairman of the Democratic State Committee, and his efforts in this capacity resulted in the choice of a Democratic Legislature, which in 1875 elected him to the United States Senate.

There he remained until 1881, maintaining with great independence and vigor, in spite of party opposition, his belief in sound money and a protective tariff. His influence and popularity among Democrats in the Middle West were for two decades probably greater than that of any other man of his times.

MacDONALD, William (1863—). An American historian, born at Providence, R. I. He graduated at the New England Conservatory of Music in 1884 and at Harvard in 1890. In the interval he was dean of the musical department of the University of Kansas. MacDonald was professor of history and economics at Worcester Polytechnic Institute (1892), and professor of history at Bowdoin until 1901, when he was chosen to a like chair in Brown University. He published: *Select Documents Illustrative of the History of the United States* (1898); *Select Charters* (1899); and *The Government of Maine* (1902).

MACDON′ELL, Alexander (1762-1840). The first Roman Catholic Bishop of Upper Canada, born in the County of Inverness, Scotland. He was educated in Paris and at the Scots College, Valladolid, Spain; entered the priesthood (1787), and was for several years a missionary to his native land in the Lochaber country. Through his influence, the first Roman Catholic regiment since the Reformation was enlisted, named the Glengarry Fencibles, and he was its chaplain in Great Britain, and afterwards the organizer of a colony for its disbanded members (1803) in Glengarry County, Ontario, where they were granted 160,000 acres of land. Father Macdonell assisted in raising the Canadian regiment of Glengarry Fencibles which played so gallant a part against the American invaders during the war of 1812-14, and he was consecrated Apostolic Vicar of Upper Canada (1820). His headquarters were at Kingston from 1826, but he was instrumental in the building of forty-eight churches throughout the province. He died in Great Britain, while soliciting contributions toward the foundation of a seminary in his see, and his body was buried in the Kingston Cathedral in 1861.

MACDONELL, Arthur Anthony (1854—). An English Orientalist. He was educated at Göttingen and at Corpus Christi College (Oxford), where he was Taylorian German scholar (1876), Davis Chinese scholar (1877), Boden Sanskrit scholar (1878), teacher of German (1880-99), deputy professor of Sanskrit (1888-99), and then Boden professor of Sanskrit. Macdonell made especial study of the Vedic period. He wrote: *A Sanskrit Grammar* (1886; revised 1901); *A Sanskrit English Dictionary* (1893); *A History of Sanskrit Literature* (1900); and "Vedic Mythology" (1897), in Bühler, *Grundriss der indo-arischen Philologie.*

McDONOGH, măk-dŏn′ō, John (1779-1850). An American philanthropist, born in Baltimore. In 1800 he settled in New Orleans, where he soon became one of the wealthiest citizens. About 1822, having become convinced of the wrongs of slavery, he adopted a system of paying his slaves wages, thus enabling them to buy their freedom. Upon his death in 1850 the greater part of his fortune of more than $2,000,000 was left to be divided equally between the cities of Baltimore and New Orleans for purposes of public education. Years of litigation followed, but the will was finally sustained. Baltimore devoted its share to establishing the McDonogh School; New Orleans has used its share in connection with its public school system.

MACDONOUGH, măk-dŏn′ō, Thomas (1783-1825). An American naval officer, prominent in the War of 1812, and frequently referred to as 'The Hero of Lake Champlain.' He was born at The Trappe (now Macdonough), Del., of Scotch-Irish descent; entered the United States Navy as a midshipman in 1800; served on the *Constellation* under Commodore Murray, in 1801-02; and in 1803 started for Tripoli in the *Philadelphia,* Commodore Bainbridge, but at Gibraltar was placed in charge of a captured Moorish frigate, and thus escaped capture and imprisonment at the hands of the Tripolitans when the *Philadelphia* ran aground on November 1, 1803. He was subsequently attached to the *Enterprise,* Commodore Decatur, and was one of the seventy men who, on February 16, 1804, entered the harbor of Tripoli under Decatur and captured and destroyed the *Philadelphia.* For this service he was made a lieutenant in May, 1804, and soon afterwards earned special mention for his gallantry in the bombardment of Tripoli. He served successively on the *Enterprise,* the *Syren,* the *Wasp,* the *John Adams,* and the *Essex,* and in 1810 was furloughed and commanded the *Gulliver,* a vessel in the merchant service. In the War of 1812 he served for a short time as first lieutenant on the *Constitution,* and commanded the Portland Station for several months, and in September, 1812, he was placed in command of the United States naval force on Lake Champlain. In the following year he was promoted to be master commander, and in Plattsburg harbor, on Sunday, September 11, 1814, with a fleet of 14 vessels, carrying 86 guns and about 800 men, he completely defeated a British fleet of 16 vessels, carrying 95 guns and about 1000 men under Capt. George Downie. For this victory he was commissioned captain, then the highest rank in the United States Navy, and received a gold medal from Congress and an estate on Cumberland Head, near Plattsburg, from the Legislature of Vermont. He subsequently until his death commanded various vessels, and went on various cruises, the last of which was to the Mediterranean as commander of the *Constitution* in 1824. He died in the following year while returning to the United States.

MACDOUGAL, măk-do͞o′gal, Sir Patrick Leonard (1819-94). A British soldier and military writer, born at Boulogne-sur-Mer, France. He studied at the Military Academy in Edinburgh, and later at the Royal Military College at Sandhurst. In 1844 he went to Canada as captain in the Royal Canadian Rifle Regiment, and remained there ten years, rising to the rank of brevet lieutenant-colonel before he was recalled to England in 1854. The next year he was sent to the Crimea, where he was promoted and decorated for his services. In 1865 he was appointed adjutant-general of Canadian militia, and at the time of the Fenian invasion (1866) devised a very efficient method of organizing his troops. He returned to England in 1869, but in 1878 was again sent to Canada as commander of the British forces, and during a time of tension between Great Britain and Russia, offered to raise 10,000 disciplined Canadian volunteers, thus establishing a precedent of colonial military aid in the quarrels of the Empire. He returned to England in 1883 and two years afterwards retired from active service with the rank of general. His writings include: *The Theory of War* (2d ed. 1858); *The Defense of the Canadian Lakes and Its Influence on the General Defense of Canada* (1862); and *Emigration: Its Advantages to Great Britain and Her Colonies* (1848).

McDOUGALL, ALEXANDER (1731-86). An American patriot and soldier. He was born in Scotland, but emigrated with his father to New York in 1755. He served in the French and Indian War as a captain of privateering vessels, and later became a prosperous merchant. McDougall was an ardent opponent of the Crown, and for writing an address called *A Son of Liberty to the Betrayed Inhabitants of the Colony* he was imprisoned for several months. In 1774 he presided over the meeting that prepared the way for the election of delegates for New York to the First Continental Congress. He became colonel of the First New York Regiment in 1775, brigadier-general in the Continental Army in 1776, and major-general in 1777, and fought at Long Island, White Plains, Germantown, and elsewhere. In 1781 and again in 1784 he was chosen a member of the Continental Congress. At the time of his death he was a member of the New York Senate.

MacDOUGALL, WILLIAM (1822-1905). A Canadian statesman, born in Toronto. He studied at Victoria College, Cobourg, and was in 1847 admitted to the bar. In 1848 he founded the *Canada Farmer*, and in 1850 the *North American*. After the *American* was absorbed into the Toronto *Daily Globe*, he continued to write for the latter until 1870. From 1862 to 1864 he was a member of the Executive Council and a commissioner of the Crownlands, from 1864 to 1869 Provincial Secretary, and from 1866 to 1867 acting Minister of Marine. He became Minister of Public Works in 1867, and in 1869 Lieutenant-Governor of Rupert's Land, Northwest Territories. In 1865 and 1866 he was chairman of a commission for opening trade relations with Mexico, Brazil, and the West Indies, and in 1873 went to London as special fisheries commissioner. He published *Six Letters on the Amendment of the Provincial Constitution* (1872).

MacDOW'ELL, EDWARD ALEXANDER (1861—). An American composer. He was born in New York City, where he studied music with J. Buitrago, P. Desvernine, and Teresa Carreño. For three years (1876-79) he was a pupil at the Paris Conservatory, and subsequently continued his studies at Frankfort-on-the-Main under Heymann and Raff. He had specialized in the pianoforte and composition, and in 1881 became head of the pianoforte department at the Darmstadt Conservatory. In 1884 he resigned his position and moved to Wiesbaden, returning four years later to the United States. In 1896 he was appointed professor of music at Columbia University. He was director of the Mendelssohn Glee Club of New York (1896-98), and president of the American Society of Musicians (1897-98). As a concert pianist MacDowell is well known, his playing being marked by virility and carefulness of interpretation. It is for his compositions, however, that he is most universally esteemed. They include concertos, sonatas, symphonies, songs, and many charming pianoforte pieces. Of the latter "Woodland Sketches," "Forest Idylls," and "Marionettes" are especially admirable. For full orchestra may be mentioned the symphonic poem "Lancelot and Elaine," the "October" Suite, and the "Indian" Suite, the latter constructed on themes taken from the music of the Sioux Indians. His work is representative of the modern romantic school in the United States, which, while retaining the classic forms, adds to them a strong individuality of treatment.

McDOWELL, EPHRAIM (1771-1830). An American surgeon, born in Rockbridge County, Va. He attended medical lectures in Edinburgh in 1793-94; settled in Danville, Ky., in 1795, and attained great prominence as a surgeon. He performed the first operation recorded in the United States in ovarian surgery in 1809. A report of this and of other cases appeared in the *Eclectic Repertory and Analytic Review* in 1817. He was skillful in every branch of the surgical art.

McDOWELL, IRVIN (1818-85). An American soldier, prominent as a Federal officer in the Civil War. He was born in Columbus, Ohio; studied at the College of Troyes in France, and in 1838 graduated at West Point, where from 1841 to 1845 he was stationed as adjutant. He served in the Mexican War first as aide-de-camp and then as assistant adjutant-general, under General Wool, and in February, 1847, was brevetted captain for "gallant and meritorious conduct in the battle of Buena Vista." Early in 1861, after the outbreak of the Civil War, he was at Washington engaged in organizing the volunteer troops. On May 14th he was promoted to be brigadier-general of volunteers. On the 27th he was placed in command of the Army of the Potomac and, urged forward by President Lincoln and the War Department under the impulsion of public opinion in the North, he advanced into Virginia in the middle of July. On the 21st he met Generals Beauregard and Johnston, commanding the Confederate army, at Bull Run, and, in spite of his skillfully laid plan of battle, his raw recruits gave way and he was badly defeated. (See BULL RUN, FIRST BATTLE OF.) Soon afterwards he was replaced by General McClellan, under whom he commanded the First Corps of the Army of the Potomac, which, however, was on April 4, 1862, formed into the Army of the Rappahannock and assigned to the defense of Washington. On March 14th of this year he was made major-general of volunteers. From August 12 to September 6, 1862, he commanded the Third Corps of the Army of Virginia, and was engaged successively in the battles of Cedar Mountain (August 9th) and Rappahannock Station (August 25th), and in the second battle of Bull Run (August 29th-30th), taking an especially prominent part in the last. On September 6th he was relieved from duty in the field, and, regarding this as a reflection upon his professional abilities and past services, he asked for a court of inquiry, which, after carefully considering all charges, reported that "the interests of the public service do not require any further investigation into the conduct of Major-General McDowell." He served from May to July, 1863, as president of the board appointed to investigate alleged cotton frauds, and from July, 1863, to May, 1864, was president of the board for retiring disabled officers. On March 13, 1865, he was brevetted major-general in the Regular Army for "gallant and meritorious services at the battle of Cedar Mountain," and seven years later he was promoted to the rank of major-general in the Regular Army to succeed General Meade. After the war he was in command of various military departments until 1882, when he retired from active service.

McDOWELL, James (1796-1851). An American statesman, born in Rockbridge County, Va. He graduated at Princeton in 1817; became a member of the Virginia Legislature in 1831; was Governor from 1842 to 1844, and was a Representative in Congress from 1847 to 1851. McDowell was a State's-Rights man, but was an opponent of slavery and advocated its gradual abolition. He was an orator of much power, and took an especially active part in the debates leading up to the Compromise of 1850.

McDOWELL, John (1780-1863). An American Presbyterian minister. He graduated at Princeton, 1801; was pastor in Elizabethtown, N. J., 1804-1833; in Philadelphia till his death there, February 13, 1863. He was moderator of the General Assembly, 1820, and permanent clerk, 1825-40. At the disruption he remained with the Old School body. While at Elizabethtown he published: *The First Bible Class Questions* (1814), and *A Bible-Class Manual* (1819). *A System of Theology, in a Series of Sermons, in the Order of the Westminster Shorter Catechism* (2 vols.), appeared 1825-26. Consult his *Life* by Sprague (New York, 1864).

MACDOWELL, Patrick (1799-1870). An Irish sculptor, born at Belfast. He studied in London under Pierre Chenu, a French sculptor, and afterwards worked in the schools of the Royal Academy, where he began to exhibit in 1822. He was elected an associate of the Academy in 1841, and a full member in 1870. His works include "Love Triumphant" (1845); the statues of William Pitt and the Earl of Chatham, for Saint Stephen's Hall; the Earl of Belfast, a bronze statue for the city of Belfast; and the group "Europe," for the Albert Memorial, London.

MacDUFF′. A thane of Scotland who was instrumental in the defeat of Macbeth at the battle of Lumphanan in 1057. In Shakespeare's tragedy *Macbeth* he is represented as deadened to feelings of humanity, though once kindly and of generous spirit.

MACDUFF, John Ross (1818-95). A clergyman of the Church of Scotland. He was born at Bonhard, Perthshire; studied at Edinburgh; entered the ministry (1843); was settled in Glasgow (1855-70), and afterwards in England. Many of his numerous devotional writings were very popular, e.g. *Morning and Night Watches* (1852); *The Wooden Tree of Lebanon* (1854); *Footsteps of Saint Paul* (1855); *Brighter than the Sun* (1877); *Wells of Baca* (1879); *Matin and Vesper Bells* (poems, 2 vols., 1890). Consult his *Reminiscences*, ed. by his daughter (1896).

McDUF′FIE, George (1788-1851). An American orator and political leader. He was born in Columbia County, Ga.; graduated at South Carolina College in 1813, and was admitted to the bar in 1814. He became a member of the South Carolina Legislature in 1818; was a Representative in Congress from 1821 to 1834; was Governor of South Carolina from 1834 to 1836; and was United States Senator from 1843, but was forced to resign in 1846 on account of ill health. When he entered Congress, McDuffie was, like his friend Calhoun, an advocate of a liberal construction of the Constitution, but, like Calhoun, soon changed his views and became a bitter opponent of the tariff and of internal improvements. He was perhaps the boldest member of the famous South Carolina Nullification Convention of 1832, and drafted the address of South Carolina to the people of the United States. He supported Jackson in the election of 1828, but soon became one of his leading opponents, and, as chairman of the Committee on Ways and Means, was one of the strongest champions of the United States Bank against Presidential attacks. McDuffie was an orator of much ability. Early in his public career he fought a duel with a former law partner, and received a wound in the spine from which he suffered until his death.

MACE. Originally a weapon in the shape of a club, but now an insignia of office and a symbol of authority used frequently in legislative chambers. The maces of the British Parliament and that of the United States House of Representatives may be cited as elaborate and costly examples of this badge of office.

MACE (OF., Fr. *macis*, Sp. *mácis*, It. *mace*, from Lat. *macir*, from Gk. *μάκερ*, *maker*, an East Indian spice). A spice which consists of the dried aril which surrounds the seed of the nutmeg (*Myristica fragrans*). When fresh it is blood-red, lacerated and somewhat fleshy; after drying in the sun for a few days, and being flattened for market, it is bright orange-yellow and has a peculiar wax-like texture. It has a peculiar, strong, agreeable smell and taste, and contains a clear, yellow, volatile oil obtained by distillation, and a red, buttery, fixed oil. The latter, when expressed, is mixed with the volatile oil and other substances and is known as nutmeg balsam. The flavor resembles that of nutmeg. It is exported chiefly from Penang and Singapore, where it is received from the Spice Islands, also from the West Indies, where it is cultivated. The aril of species of *Myristica fatua* sometimes appears in commerce as mace, but it is coarse and very inferior.

MACÉ, mȧ′sȧ′, Jean (1815-94). A French littérateur and educator, born in Paris. At the age of twenty he was a teacher of history in the Collège Stanislas. At the time of the Revolution of 1848, he supported the new Government with enthusiasm, as one of the editors of *La République*. On Napoleon's *coup d'état*, in 1851, he was obliged to leave Paris, and became teacher of natural sciences and literature in a seminary for girls in Alsace. Here he conceived the plan of popularizing scientific studies for children, and began by the publication of the *Histoire d'une bouchée de pain* (*History of a Mouthful of Bread*) (1861), letters to a little girl, explaining, with the interest of a story, the laws of digestion. This plan was continued in a series of books, which have had a great popularity. In 1866 he had organized a teachers' league, *Ligue de l'Enseignement*, which promoted popular education, not only through schools, but also through the formation of communal libraries, and by its insistence upon free and obligatory education.

In 1883 he was elected to the Chamber as Life Senator.

MACEDO, mȧ-chä'dô. The name applied to the miniature painter Giulio Clovio (q.v.).

MACEDO, mȧ-sä'do, Joaquim Manoel de (1820-82). A Brazilian poet and scientist, born at São Joã de Itaborahy. He became a doctor of medicine, but was soon elected professor of Brazilian history and geography in the College of Dom Pedro at Rio de Janeiro. He was an active member of the Historical and Geographical Institute. His literary productions include several novels, among them *Moreninha* (1844; 5th ed. 1877); *O moço louro* (1845; 5th ed. 1877); the tragic plays, *O Cézo* (1849) and *Cobé* (1855); the erotic epic lyric *A Nebulosa* (1857), a story of Brazil, in unrhymed decasyllabics, showing much lyric grace and metrical charm; and, among the scientific works that filled his later years, *Nociones de cronografia del Brasil* (1873), which has been translated into French by Halbout.

MACEDO, José Agostinho de, Padre (1761-1831). A Portuguese poet and author, born at Beja. He entered the Augustinian Order, but was expelled and took up the life of a traveling preacher, and finally became Court chaplain (1802). His trenchant pen and fund of invective made him feared by all; he posed as the literary dictator of Portugal, and his influence was extraordinary, but his scholarship was superficial and he had little talent as a poet. He tried his hand at politics and was elected to the Chamber of Deputies (1812). In 1830 he was made Court chronicler by the usurper Dom Miguel. His works include: *Gama* (1811), an epic better known under its later title in the revised edition *O Oriente* (1814); *Os Burros* (1812), serio-comic, and *A Meditação* (1813), his best work, often reprinted. As a critic his best writings are *Motim literario* (1811); *As Pateadas* (1812); and his periodical *O Desaprovador* (1818-19).

MACEDONIA, măs'ê-dō'nĭ-ȧ, or **MACEDON** (Lat., from Gk. Μακεδονία, *Makedonia*). Anciently, the name of the district lying north of Thessaly on the northwestern shore of the Ægean. Originally its territory was confined to the region of Mount Olympus and the Cambunian Mountains, east of the ridge which forms the boundary of Epirus and Illyria, and west of the Axius, a river emptying into the Thermaic Gulf. Later under Philip II. it was extended as far east as the Strymon. The country was on the whole mountainous, but where it touched the sea, on the shores of the Thermaic Gulf, was a fertile plain, watered by the Haliacmon and Axius, and the valley of the Strymon was also productive. Macedonia was famous among the ancients for its gold and silver mines, and its productiveness in oil and wine. It contained a number of flourishing cities, particularly Pella, the capital; Pydna, Thessalonica (Therma), Potidæa (later rebuilt as Cassandria), Olynthus, Philippi and Amphipolis. These cities, with the exception of Pella and Philippi, were colonized by Greeks—Ionian Greeks, except in the case of Potidæa, which represented Dorian colonization. The Macedonians seem to have been a Grecian tribe, which had remained behind during the earlier migrations, and so been cut off from the later development of the Hellenes. Their language was almost certainly a Greek dialect, and their government bears a striking resemblance to the Homeric State. At the same time they were not recognized by the Greeks as entitled to the Hellenic name, though their kings claimed descent from Hercules, and were allowed, as Greeks, to compete in the Olympic games. The scattered tribes that inhabited the region are said to have been first brought under a common rule about B.C. 700, when the supremacy was acquired by the family of the Argeadæ. Their first capital was at Ægæ, but later they established themselves at Pella. The history of Macedonia is involved in much obscurity till about B.C. 490, when the Persians subdued the country, so that the Macedonian King, Alexander I., was compelled to take part with Xerxes in his invasion of Greece. On the retreat of the Persians after the battle of Platæa in B.C. 479, Macedonia again recovered its independence. The development of the country was hampered by the chain of Greek colonies along the coast, and especially by the powerful cities of Chalcidice, with Olynthus at their head. Under the vigorous reign of Archelaus, who died B.C. 399, it greatly increased in prosperity and power; but after his death a period of civil wars and contests for the throne ensued, which ended in the accession of Philip II. (B.C. 359), who not only seated himself firmly on the throne, but knew how to develop the resources of his kingdom, and so to direct the warlike spirit of his subjects as greatly to extend his dominions. Before his death he was recognized as the leader of Greece, while he had brought the Illyrians and Thracians under subjection, and completely destroyed the independence of the Greek cities on the coast. His son, Alexander the Great (q.v.), brought half the then known world under his sway, but after his death the Macedonian Empire was divided among his generals. (See Greece.) Macedonia itself fell to the lot of Antipater, after whose death (B.C. 319) ensued another period of civil wars which ended in the accession of Antigonus Gonatas. His successors were involved in constant wars with the Ætolian and Achæan Leagues, and finally with the Romans, who broke the power of Philip V. at Cynoscephalæ in B.C. 197, after which they proclaimed the independence of Greece, and later overthrew Perseus, his successor, at Pydna (B.C. 168). A renewed attempt at a rising in B.C. 148 was followed in B.C. 146 by the organization of the country as a Roman province, in which Thessaly and part of Illyria were included. In the New Testament Macedonia always means the Roman province. It was one of the most important fields of the missionary labors of Paul, who founded churches in its cities on his second journey (Acts xxii. 15) and visited the province several times. The epistles to the Thessalonians and Philippians were addressed to Macedonian churches, and the loyalty and devotion of Macedonian Christians are often commended in Paul's letters. After the final division of the Roman Empire (A.D. 395), Macedonia formed part of the Eastern or Byzantine Empire. It was overrun by barbarous hordes, and by the seventh century the old semi-Greek Macedonians were extinct. For a considerable period the Bulgarians held sway in Macedonia. Early in the eleventh century the Byzantine rule was reëstablished. In the fourteenth century the country was included in the great Servian realm, and after another period of Byzantine rule it came, in the fifteenth century, under the dominion of the Turks.

There is now no official division known as Macedonia, but the name has recently come into wide use in connection with the strife of nationalities in the Turkish dominions. The ancient region corresponds nearly to the modern Vilayet of Saloniki, with the eastern part of that of Monastir. The population consists mainly of Slavs (made up of Bulgarian and Serb elements, the Bulgarian element predominating in the language), Turks, Greeks, Albanians, and Zinzars (Macedo-Rumans). The agitation of the Christian subjects of the Porte in this portion of the Turkish Empire, and the ambition of Greece and Bulgaria to annex part of the territory, have created the so-called Macedonian question in Eastern European politics. At the Congress of Berlin, in 1878, certain stipulations were made for autonomous institutions for the Macedonian Christians. In 1895 the Bulgarians tried to foment a revolt of the Christians against Turkish rule. This was unsuccessful, owing chiefly to the influence of Russia. The Bulgarian Government proposed a plan of reform to the Porte, but in 1896 the Greeks started a movement in Macedonia, and throughout the country bands of guerrillas attacked the Turkish regulars. The Greek agitators in Macedonia claimed that their movement was not directed against the Turks, but against the pretensions of Bulgaria. The situation in the region reached an acute stage in 1903, bloody encounters between the inimical nationalities taking place.

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MACEDONIAN LANGUAGE. The native language of the ancient Macedonians. It is only imperfectly known through glosses preserved by Suidas and other lexicographers and through proper names. More than a hundred Macedonian words with their Greek equivalents were collected by Sturz. About the same number of proper names may be found explained in Fick's dissertation. As to the character of the language, K. O. Müller, G. Meyer, and F. Blass have refused to recognize it as a Greek dialect, urging a closer kinship to the Illyrian or the Thracian; while Sturz, Abel, Basmatzides, Fick, Demitsa, Ed. Meyer, Hatzidakis, Kretschmer, and apparently Brugmann have maintained that Macedonian is only a Hellenistic dialect. The strongest argument against the latter view is that β, γ, and δ have a tendency to take the place of Greek φ, χ, and θ, as in Slavonic, Celtic, Lithuanian, and Illyrian. It is possible, however, that β and δ were pronounced by the Macedonians as *bh*, *v*, and *dh*(*th* in *this*), and that the change of *ph* to *bh* and *th* to *dh* has nothing in common with the process by which the Illyrian *b* and *d* have been derived from *bh* and *dh*. Of the Macedonian χ there are many instances. The fact that the digamma has disappeared without compensation only seems to show the operation of the same laws as govern Greek speech. While many Macedonian words and nouns are not yet satisfactorily explained, a great number have been. Alexander, his generals and his nobles spoke Attic Greek as well as their native dialect. But Attic Greek cannot have been long in vogue in Macedonia. When, therefore, the nobles are called *ἑταῖροι*, as in the Homeric poems, and many proper names occur that are found in Homer but not in the later times, the only probable conclusion seems to be that the Macedonians were a Greek people remaining behind when the rest moved into the peninsula, and that their language was a dialect retaining some peculiarities lost in the other dialects and developing by contact with neighboring Illyrian and Thracian languages some peculiarities of its own. Consult: Sturz, *De Dialecto Macedonica et Alexandrina* (Leipzig, 1808); O. Müller, *Ueber die Wohnsitze, die Abstammung und ältere Geschichte des macedonischen Volkes* (Berlin, 1825); Abel, *Makedonien vor König Philipp* (Leipzig, 1842); Basmatzides, 'Η Μακεδονία καὶ οἱ Μακεδόνες (Monaco, 1867); Fick, "Makedonische Glossen," in *Zeitschrift für vergleichende Sprachforschung*, vol. xxii., p. 193 sqq.; Hatzidakis, Περὶ τοῦ Ἑλληνισμοῦ τῶν ἀρχαίων Μακεδόνων (Athens, 1896); Ed. Meyer, *Geschichte des Altertums*, vol. ii. (Stuttgart, 1893); Kretschmer, *Einleitung in die Geschichte der griechischen Sprache* (Göttingen, 1896).

MACEDONIANS. A party which arose toward the close of the Arian controversy, and took its name from Macedonius, who became Patriarch of Constantinople in 341 and was finally deposed in 360, in which year he died. Their distinctive doctrine was the denial of the divinity of the Holy Ghost. Macedonius taught that the Holy Ghost was subordinate to the Father and to the Son, alike to them in substance, and a creature. After Macedonius the leader was Marathonius, Bishop of Nicomedia, from whom the party is sometimes called Marathonians. It was a considerable one, but its doctrine was condemned in the second General Council (Constantinople, 381), when there was also added to the Nicene creed the special clause by which the divinity of the Holy Ghost is defined. They are also called *Pneumatomachi*, or 'Adversaries of the Spirit.'

MACEIÓ, mä'sâ-yō', or **MAÇAYÓ**, mä'sī-yō'. The capital of the State of Alagoas, Brazil, situated on the Atlantic coast, 130 miles southwest of Pernambuco (Map: Brazil, K 5). The town is pleasantly located, has a fine cathedral, a government building, and a lyceum. Its most important manufactures are cotton goods and machinery. Its harbor is provided with shipyards. It exports cotton, corn, and hides, and is the seat of a United States consular agent. Population, 12,000.

McEN'TEE, JERVIS (1828-91). An American landscape painter. He was born in New York, and studied with F. E. Church. In 1858 he opened a studio in New York, where he soon obtained a high position among American artists. His principal success was gained in the depiction of grave mountain or woodland scenery. In 1861 he was elected a member of the American Academy of Design. His works include: "Indian Summer" (1861); "October Snow" (1870); "Winter in the Mountains" (1878); "The Kaatskills in Winter" (1884); and "Shadows of Autumn" (1886).

MACEO, mȧ-sä'ō, Antonio (1848-96). A Cuban patriot and military leader. He was born at Santiago de Cuba, and in the Cuban revolution of 1868-78 joined the insurgents as a private. Though originally but a mulatto farm-hand, he rose to be second to Gomez among the Cuban leaders. He defeated Martinez Campos at Demajagua and La Galleta, conducted a very skillful campaign at Baracoa, and in 1878 completely routed Santocildes at San Ulpiano. He refused to sign the Peace of Zanjon. Having traveled in various American countries, he unsuccessfully attempted in 1890 to start a fresh Cuban revolution. In the uprising of 1895 he took a most distinguished part. Probably the most brilliant achievements of the Cubans during the war were his two invasions of, and his campaign in, Pinar del Rio Province, in which he was opposed to the best of the Spanish troops; and his combats at Paralejo, Jobito, Mal Tiempo, Sao del Indio, and Candelaria. Accompanied by only his staff, he crossed the trocha between Majana and Mariel, was surrounded by a considerable Spanish force, and was killed.

MACERATA, mä'chȧ-rä'tȧ. A walled town of Central Italy, and capital of the province of the same name. It is finely situated in the midst of hills, on a lofty eminence, about 22 miles south-southwest of Ancona, and commands picturesque views of the sea and the Apennines (Map: Italy, H 4). The streets are straight and well paved, and there are some fine public edifices, including a cathedral, conventual establishments, and palaces. The palazzo municipale, or town hall, is a beautiful building of the thirteenth century. Macerata is prosperous, and a provincial centre of intellectual and social Italian life. Of its ancient university, however, only the faculty of jurisprudence is still in existence. Population (commune), in 1901, 22,784.

MACFARLANE, măk-fär'lan, Charles (?-1858). A Scotch author. From 1816 to 1827 he lived in Italy, and in 1827-28 he was in Constantinople. In 1829 he settled in London as a miscellaneous writer. Subsequently he again traveled in Italy and Turkey. He died, a poor brother, at the Charterhouse, December 9, 1858. To Knight's *Pictorial History* (1838-44) he contributed the *Civil and Military History of England*, afterwards abridged as the *Cabinet History of England* (1845-47). He wrote popular biographies of Marlborough (1852), Napoleon (1852), and Wellington (1853), and several historical novels, as the *Armenians* (1830), and *Old England Novelettes* (1846-47).

MACFARLANE, Robert (1734-1804). A Scotch author and editor. He was educated at Edinburgh, and was for a time editor of the London *Morning Chronicle*. He prepared a complete edition of Ossian in the Gaelic, with a Latin translation (3 vols., 1807). Volumes i. and iv. of the *History of the Reign of George III.* (1770-96), published by Evans, are also by him.

MacFAR'REN, George Alexander (1813-87). An English composer, the son of George Macfarren, the dramatist. He was born in London, and after having studied music for two years with Lucas, entered in 1829 the Royal Academy of Music. Upon leaving there in 1836 he taught music at a school in the Isle of Man, but returned to the Academy the next year and was appointed professor of harmony. In 1844 he founded the Handel Society, and in 1845 became conductor at Covent Garden. In 1875 he succeeded William Sterndale Bennett as principal of the Royal Academy of Music, and the same year became professor of music at Cambridge University. In 1860 his eyesight, which had been growing weak for years, had failed entirely, but despite this calamity Macfarren continued his work as before. His death occurred at London. As a composer his works lacked inspiration, and he exercised little influence on his contemporaries. His theoretical treatises, however, are clear and forceful presentations of his views on harmony and composition. His best compositions were: the cantatas "Lenora," "May Day;" the operas *Robin Hood* (1860), *Don Quixote* (1846), *The Devil's Opera* (1838); the oratorios *Joseph* (1872), *Saint John the Baptist* (1873), and *Saint George's Te Deum* (1884). Of his writings, *Rudiments of Harmony* (1860) and *Six Lectures on Harmony* (1867) are important. Consult Banister, *G. A. Macfarren, His Life, Works, and Influence* (London, 1891).

McFIN'GAL. A satirical political poem, in the metre of Butler's *Hudibras*, by John Trumbull, the first part published in 1775, the whole in 1782. The hero, a Tory New England squire in Revolutionary days, carries on a controversy with the leader of the Whigs. It was extremely popular, and was reprinted many times.

MacFLECK'NOE, or a Satire on the True Blue Protestant Poet, T. S. A poem by Dryden, published in 1682, in which Thomas Shadwell is depicted as the adopted son and heir of Richard Flecknoe, an Irish priest, famous for his bad verses. The satire was imitated by Pope in his *Dunciad.*

McFLIM'SEY, Flora. The heroine of William Allen Butler's *Nothing to Wear* (q.v.).

MacGAHAN, măk-gä'han, Januarius Aloysius (1844-78). An American journalist and traveler, born in Lexington, Ohio. As a correspondent of the New York *Herald* (1870-71) he was with Bourbaki's army in the Franco-Prussian War, went to Lyons and Bordeaux, and attracted much attention by his interviews with republican, monarchical, and clerical leaders. He was the only newspaper correspondent in Paris during the whole period of the Commune, and he narrowly escaped death. He afterwards visited Russia as *Herald* correspondent, accompanied the expedition to Khiva, contrary to Russian orders, and told his experience in *Campaigning on the Oxus* and *The Fall of Khiva* (1874). He had already reported the Alabama Conference at Geneva and accompanied General Sherman to the Caucasus. He reported the Carlist War in Spain (1874), and made a Polar voyage (1875), described in *Under the Northern Lights* (1876). He then investigated as a journalist the Bulgarian atrocities, accompanied by the United States Commissioner, Eugene Schuyler (q.v.). His *Turkish Atrocities in Bulgaria* (1876) helped to free the hands of Russia for the Turkish War. He accompanied the Russian army, though crippled by accidents, and gave the most vivid picture of the fighting at Shipka and Plevna. He was preparing to attend the International Congress at Berlin (1878) when he died of fever at Constantinople.

McGEE, m'-gē', ANITA NEWCOMB (1864—). An American physician. A daughter of Prof. Simon Newcomb, she was born in Washington, D. C., and educated in that city and in Europe. In 1888 she married the ethnologist, W J McGee, and four years afterwards received the degree of M.D. from Columbian University, Washington. She originated and was director of the Hospital Corps of the Daughters of the American Revolution, which chose the trained women nurses during the Spanish-American War. In August, 1898, by her appointment as acting assistant surgeon of the United States Army, she became the only woman officer of the army. She was assigned to duty under the surgeon-general to organize and administer an army nurse corps, as the women nurses employed numbered then considerably more than one thousand. She resigned on completion of this work, December 31, 1900, when the corps was by act of Congress made a permanent part of the army.

McGEE, THOMAS D'ARCY (1825-68). An Irish-Canadian politician and author. He was born in Carlingford, Ireland, emigrated to America when seventeen years of age, and settled in Boston, Mass., where he became editor of the *Pilot.* He returned to Ireland in 1845, and until 1848 he remained an editor of the Dublin *Nation.* Again he crossed the ocean, and became proprietor and editor of the New York *Nation.* In 1857 he changed his residence to Canada, established *The New Era* in Montreal, and was a member of Parliament from 1858 until his death. He was also twice a member of the Ministry, and for one term was president of the Council. Because of his opposition to the Fenian movement he was assassinated. He was the author of a number of important works, including: *History of the Irish Settlers in North America* (1851); *History of Attempts to Establish the Protestant Reformation in Ireland* (1853); *Popular History of Ireland* (1862); and a volume of poems (1869).

McGEE, W J (1853—). An American geologist, anthropologist, and ethnologist. He was born near Dubuque, Iowa, and devoted his earlier years partly to reading law and to surveying, partly to improving agricultural implements, several of which he patented. He began the study of archæology and geology in 1875, and in 1877-81 executed a topographic and geological survey of 17,000 square miles in northeastern Iowa. In 1881 he was appointed geologist on the United States Geological Survey, and in 1885 and 1892 compiled standard geological maps. In 1893, having resigned from the Geological Survey, he was appointed ethnologist-in-charge in the Bureau of American Ethnology. In 1895 he explored the Isla del Tiburon, Gulf of California, home of the Seri Indians, a savage tribe which until then had not been studied. His publications include: *The Pleistocene History of Northeastern Iowa* (1889); *The Geology of Chesapeake Bay* (1888); *The Siouan Indians* (1895); *Primitive Trephining* (1897); *The Seri Indians* (1899); *Primitive Numbers* (1901); and many other memoirs and minor papers.

McGIFFERT, m'-gĭf'fērt, ARTHUR CUSHMAN (1861—). An American theologian and author, born at Sauquoit, N. Y. He studied at the Western Reserve College and graduated at Union Theological Seminary in 1885. Afterwards he continued his studies in Germany at the universities of Berlin and Marburg, and in Paris and Rome. He became instructor in Church history at Lane Theological Seminary in 1888, and professor there in 1890. He held this position until he was appointed professor of Church history at Union Theological Seminary in 1893. Dr. McGiffert's book, *A History of Christianity in the Apostolic Age* (1897), was much criticised and he withdrew from the Presbyterian ministry in order to avoid an almost inevitable trial for heresy. He retained his position as professor of Church history in the Union Theological Seminary, and afterwards joined the Congregational Church. He also wrote *Dialogue Between a Christian and a Jew* (1888, Doctor's thesis), and a translation of Eusebius's *Church History* (1890, with prolegomena and notes).

McGIFFIN, m'-gĭf'fĭn, PHILO NORTON (1863-97). An American naval officer, born in Pennsylvania. He graduated in 1882 at the United States Naval Academy, and at the outbreak of the war between China and France resigned from the navy to enter the Chinese service. In 1887 he succeeded in founding the naval college at Wei-hai-wei, of which he took charge in company with Lieutenant Bouchier of the British Navy. During the China-Japan War he became commander of the Chinese fleet at the battle of Yalu River. His vessel scarcely escaped destruction, and he himself was severely injured.

McGILL', JAMES (1744-1813). The founder of McGill University, Montreal, born in Glasgow, Scotland, October 6, 1744. He went to Canada about 1770 and there he eventually made a fortune in the fur trade and in business at Montreal. He was for a long while a member of the Parliament of Lower Canada and afterwards of the legislative and executive councils. In the War of 1812 he was brigadier-general of the militia. He died in Montreal, December 19, 1813. In his will he left £10,000 and certain lands for a college to bear his name. The institution founded under this bequest was erected into a university by royal charter in 1821.

McGILL COLLEGE AND UNIVERSITY. An institution of learning in Montreal, Canada, founded under a bequest of Hon. James McGill in 1821 and reorganized by an amended charter in 1852. The university has five faculties: Arts, admitting women, mainly in separate classes and conferring the degrees of B.A., M.A., B.Sc., M.Sc., D.Sc. and D. Litt; applied science, conferring the degrees B.Sc., M.Sc. and D.Sc.; law, conferring the degrees of B.C.L. and D.C.L.; medicine, confering the degrees of M.D. and C.M. It stands at the head of a group of affiliated colleges and schools and is itself affiliated with the universities of Oxford, Cambridge, and Dublin. The supreme authority of the university is vested in the Crown and is exercised by the Governor-General of Canada as Visitor. The highest academic body is the corporation, composed of the governors, principal, and fellows. The governors, fifteen in number, are the members of the Royal Institution for the Advancement of Learning. The president of the board of governors is ex-officio chancellor. The principal is the academic head and chief administrative officer, and is ex-officio vice-chancellor. The fellows, forty-three in number, are selected with reference to representation of all the faculties of affiliated colleges and of other bodies. The university had a total attendance, in 1902, of 1026 students and a faculty of 76. The library contained 92,000 volumes. The endowment of the university was $3,009,994, its grounds and buildings were valued at $2,265,964, and its gross income was about $410,000.

MACGILLICUDDY REEKS, m'-gĭl'ĭ-kŭd'-dĭ rēks. A group of mountains in the southwestern part of Ireland (Map: Ireland, B 4). They rise from the western shores of the Lakes of Killarney to the height of 3414 feet, being the highest peaks in the island, and are noted for the beauty of their scenery.

McGILLIVRAY, m'-gĭl'ĭ-vrā, Alexander (c.1740-93). A noted chief of the Creek Indians, the son of a Scotch trader by a half-breed woman. He was well educated at Charleston and was afterwards placed by his father with a mercantile firm in Savannah, where he remained but a short time, when he returned to the Creek country and became a partner in the firm of Panton, Forbes & Leslie, which had almost a monopoly of the Creek trade. On the death of his mother, who came of ruling stock, he succeeded to the chiefship, but refused to accept it until called to it by a formal council, when he assumed the title of Emperor of the Creek Nation. His paternal estates having been confiscated by Georgia on the outbreak of the Revolution, he joined the British side with all his warriors and was a prominent instigator in the border hostilities until 1790, when he visited New York with a large retinue and made a treaty of peace with the United States on behalf of his tribe. In accordance with special instructions from Washington to do everything possible to secure his influence for the United States, he and his party were entertained by the Tammany Society, while McGillivray was persuaded to resign his commission as colonel in the Spanish service for the commission of major-general in the service of the United States. He continued to rule as principal chief of the Creek Nation until his death.

McGillivray's character exhibits a curious mixture of Scotch shrewdness, French love of display, and Indian secretiveness. At his residence in Little Talâssee, on the Coosa, a few miles above the present Wetumpka, Ala., he kept a handsome house with extensive quarters for his negro slaves. In the Indian wars McGillivray tried, so far as possible, to prevent unnecessary cruelties, being noted for his kindness to captives, and his last work was an effort to bring teachers among his people. On the other hand, he conformed much to the Indian custom, and managed his negotiations with England, Spain, and the United States with such adroitness that he was able to play off one against the other, holding commissions by turn in the service of all three.

McGILLIVRAY, William (1796-1852). A Scotch naturalist, born at Old Aberdeen. He graduated at King's College, Aberdeen, and devoted himself to his favorite study of natural history. In 1823 he was appointed keeper of the museum in the university, and in 1831 he received a similar appointment in the Royal College of Surgeons at Edinburgh. In 1841 he was appointed professor of natural history in Marischal College and the University of Aberdeen. His writings include: *Systematic Arrangement of British Plants* (1830; 10th ed. 1858); *History of British Birds* (1837-52); and *A Manual of British Ornithology* (1840-42). His edition (the 6th, enlarged, 1845) of Thomas Brown's *Conchologist's Text-Book* was much used.

McGLYNN', Edward (1837-1900). An American Roman Catholic clergyman. He was born in New York, September 27, 1837, of Irish parents. He was educated at the Propaganda in Rome, was ordained there, and in 1866 became pastor of Saint Stephen's Church in New York, but in 1886 was removed by the Archbishop, on account of his opposition to parochial schools, and especially because of his persistent advocacy of Henry George's single-tax theories, which were declared at variance with Roman Catholic teachings. He was soon after summoned to Rome to give an account of himself, but he refused to go. On the contrary, he boldly advocated in public the doctrine 'no politics from Rome.' In July, 1887, he was excommunicated. In December, 1892, after a hearing before the Apostolic Delegate, Mgr. Satolli, he made his submission and was restored to his priestly functions. He was in charge of a parish at Newburgh, N. Y., until his death, January 7, 1900. He aided in founding the Anti-Poverty Society, and became its president (1887).

McGREADY, m'-grā'dĭ, James (c.1760-1817). A Presbyterian minister and revivalist. He was born in western Pennsylvania. After a course of study preparatory to entering the ministry in the school of Dr. John McMillan, of Cannonsburg, Pa., he was licensed to preach in 1788. He then labored as a minister in North Carolina, and in 1796 removed to southwestern Kentucky. The great revival of 1800, which marked an epoch in the religious history of the region west of the Alleghanies, began under his ministrations. He introduced camp meetings. His employment as preachers of young men not ordained and without education aroused opposition in the Presbyterian Church, one of the consequences of which was the organization of the Cumberland Presbyterian Church. He was censured by his Presbyterian brethren, but ultimately made his peace with the Church, and returned to his former presbytery. A collection of his sermons was published after his death (vol. i., Louisville, 1831; vol. ii., Nashville, 1833). Consult: Edson, *Early Presbyterianism in Indiana* (1898); Smith, *History of the Cumberland Presbyterian Church;* Foote, *Sketches of North Carolina, Historical and Biographical* (New York, 1850; second series, 1855); Davidson, *History of the Presbyterian Church in the State of Kentucky,* etc. (New York, 1847).

MacGREGOR, m'-grĕg'ẽr, James (1830—). A minister of the Free Church of Scotland, born at Callander, Perthshire, January 6, 1830. He was educated at the University of Edinburgh and at New College. After a successful period as minister in Edinburgh and Paisley, he was appointed professor of systematic theology in New College, Edinburgh (1868). In 1882 he went to New Zealand, where he became minister of Columba Church, Oamaru. Among his many publications are: *Text-Book on Christian Doctrine* (1861); *The Sabbath Question* (1865);

Handbook on Galatians (1875; since reprinted); *Handbook on Exodus* (1889; since reprinted); *Apology of the Christian Religion* (1892); *The Revelation and the Record* (1893); *The History of Christian Apologetics* (1894).

McGREGOR, John (1797-1857). A Scotch author, born at Drynie, Ross-shire. After spending some time in Canada, he returned to England and was sent by the Government on a commercial mission to several Continental States. In 1840 he was made joint secretary to the Board of Trade, which office he gave up in 1847, to accept a seat in Parliament as a member for Glasgow. In Parliament, as previously, he was a supporter of free trade. He was the author of a number of statistical compilations such as *Commercial and Financial Legislation of Europe and America* (1841); and *A Digest of the Productive Resources, etc., of All Nations* (1844-48); also of a *History of the British Empire from the Accession of James I.* (1852).

MACGREGOR, John (1825-92). An English traveler, born at Gravesend, graduated at Trinity College, Cambridge, and entered at the Middle Temple in 1847. In 1849-50 he made a tour of Europe, Egypt, and Palestine, and on his return was called to the bar. He afterwards visited every European country, as well as Algeria, Tunis, the United States, and Canada, and was a writer for *Punch* and other periodicals. In 1865, in a canoe of his own design and make, he accomplished through European rivers and lakes a voyage of which he afterwards gave an account in a book entitled *A Thousand Miles in the Rob Roy Canoe* (1866). There followed other voyages of the same kind, of which we have record in *The Rob Roy on the Baltic* (1867), *A Voyage Alone in the Yawl Rob Roy* (1867), and *The Rob Roy on the Jordan* (1869)—books deserving the enthusiastic reception which they encountered.

McGUFFEY, William Holmes (1800-73). An American educator. He was born in Washington County, Pa.; graduated at Washington College, Pa., in 1825; was a professor first of ancient languages and later of moral philosophy in Miami University in 1836-39; was president of Ohio University in 1839-43; and professor of moral philosophy in the University of Virginia from 1845 until his death. He compiled the so-called 'Eclectic Series,' a series of readers and other school books, of which immense numbers were sold.

MACH, mäG, Ernst (1838—). An Austrian physicist, born at Turas, Moravia, and educated in Vienna. He was made professor of mathematics at Gratz in 1864, and of physics at Prague in 1867. After spending six years in Vienna (1895-1901) he retired from academic activities, and was appointed member of the Austrian House of Peers. After many years devoted to pure physics, especially to the study of light, sound, and electricity, he began to write on the history and philosophy of physics, and, following out logically the new mechanical theories of time and space, to correlate modern physics to psychology; this last especially in *Analyse der Empfindungen* (1886; 2d ed. 1900; English version by Williams, 1897), a work widely discussed in Germany, as is his *Principien der Wärmelehre* (2d ed. 1900), which is equally suggestive by reason of its treatment of the general method of natural science. Mention should be made also of his *Compendium der Physik für Mediciner* (1863); *Lehre von den Bewegungsempfindungen* (1875); and *Die Mechanik in ihrer Entwickelung* (4th ed. 1901).

MACHÆRODUS, må-kē′rô-dŭs (Neo-Lat., from Gk. *μάχαιρα*, *machaira*, sword, sabre + *ὀδούς*, *odous*, tooth). A fossil ancestor of the cat family, having enormous upper canine teeth, found in deposits of late Tertiary age in North America, South America, Asia, and Europe. See Sabre-toothed Tiger.

MACHÆRUS, må-kē′rŭs (Lat., from Gk. *Μαχαιροῦς*, *Machairous*). A strong fortress of Perea. Josephus (*Wars*, vii., 6, 2) says it was originally a tower built by Alexander Jannæus as a check to the Arab marauders. It was on a lofty point, surrounded by deep valleys, and of immense strength. Gabinius captured it from the grandson of Alexander Jannæus and destroyed it (*Ant.* xiv., 5, 4), but it was again fortified by Herod (*Wars*, vii., 6, 2), who used it as one of his principal residences. On the death of Herod it passed to Antipas, by whose order John the Baptist was imprisoned here and finally put to death (*Ant.* xviii., 5, 2). After the fall of Jerusalem it was occupied by the Jewish banditti, but it was finally captured (A.D. 72) by the Romans and razed (*Wars*, vii., 6, 1-4). Pliny calls Machærus the second citadel of Judæa (*Histor. Nat.* v., 16, 72). Its site was identified by Seetzen with the extensive ruins now called Mkaur on a rocky spur jetting out from Jebel Attarus toward the north, and overhanging the valley of Zerka Main. Consult G. A. Smith, *Historical Geography of the Holy Land* (London, 1897).

MACHAULT, må′shō′, or **MACHAUT,** Guillaume de. A French poet and musician. See Guillaume de Machault.

McHENRY, măk-hĕn′rĭ, James (1753-1816). An American military surgeon and politician, born at Ballymena, County Antrim, Ireland. He studied for a time at Dublin, but about 1771 removed to America and soon afterwards began the study of medicine under Dr. Rush (q.v.) in Philadelphia. He joined the Continental forces at the outbreak of the Revolution and was appointed surgeon of the Fifth Pennsylvania Battalion in 1776; was taken prisoner at Fort Washington in November of the same year, but was released on parole in January, 1777, and was exchanged in March, 1778. He became assistant secretary to Washington the following May and in October, 1780, was transferred to the staff of General Lafayette with the rank of major. In 1781 he was elected to the Maryland Senate, of which he continued a member until 1786, although he was, during the last three years, also a delegate to the Confederation Congress. In 1787 he was elected to the Constitutional Convention, in 1789 to the General Assembly, and from 1791 till 1796 was in the Maryland Senate. In the latter year he accepted the appointment of Secretary of War in Washington's Cabinet, a position which he continued to hold in Adams's Cabinet until 1800. He was a strong Federalist and favored a vigorous policy in strengthening the army and navy. He notified Washington of his appointment as commander-in-chief in 1798 at the time of the trouble with France, and was one of the most active members of the Cabinet in advocating Hamilton's appointment to the place of second in command. His partisanship in favor of Hamilton finally led President Adams to request his resignation. He then retired to Maryland, where he lived during the remainder of his life. Fort McHenry (q.v.) was named in his honor.

McHENRY, James (1785-1845). An American physician and author, born at Larne, County Antrim, Ireland. He studied at Dublin and Glasgow, and then practiced for a time in Ireland, but in 1817 emigrated to the United States. In 1842 he was appointed United States consul at Londonderry, a post he held until his death. His writings include: *O'Halloran, or the Insurgent* (1824); *The Wilderness, or Braddock's Times, a Tale of the West* (2 vols., 1823); *The Betrothed of Wyoming* (2d ed. 1830); *Jackson's Wreath* (1829); and *The Usurper, an Historical Tragedy,* which was played at the old Chestnut Street Theatre in Philadelphia in 1829.

MACHIAS, mȧ-chī′*a*s. A town and the county-seat of Washington County, Maine, 62 miles east by south of Bangor; on the Machias River, 12 miles from its mouth and at the head of navigation, and on the Washington County Railroad (Map: Maine, J 6). It has a fine court-house, jail, Federal Government building, United States Marine Hospital, and the Porter Memorial Library with 4600 volumes. Machias is chiefly engaged in shipbuilding and lumber manufacturing, and in the coastwise and lumber trade. There is good water power. Population, in 1890, 2035; in 1900, 2082.

In 1633 several Englishmen established a trading post here, but the French forced them to leave in the same year, and the post was removed. Machias was settled in 1763, became a township in 1770, and was incorporated as a town in 1784. From August 1 to November 1, 1777, it was besieged, and on August 17th it was unsuccessfully attacked by a small British fleet under Sir George Collier. Out of the original township, East Machias, Machiasport, Whitneyville, and Marshfield were subsequently created. Consult *Memorial of the Centennial Anniversary of the Settlement of Machias* (Machias, 1863).

MACHIAVELLI, mä′kyȧ-vĕl′lė, Niccolò (1469-1527). An Italian historian, statesman, and man of letters. He was born in Florence, May 3, 1469, the second of four children of Bernardo Machiavelli and Bartolomea dei Nelli. His family belonged to the Tuscan nobility, but for some time had been poor in worldly goods. Of his early life we have little authentic information. He had the literary education of a well-born Florentine of his day, knew some law, wrote Latin readily, but had no acquaintance with Greek. His abundant knowledge of later years was the result of private study, thought, and observation of men and events. In 1494 he obtained a post in the Second Chancellery of Florence, comprising the bureaus of Foreign Affairs and War. This was at the time of the expulsion of the Medici and the establishment of a new republican government under the auspices of Savonarola. He became first Secretary of the Ten in 1498, and held the position for fourteen years. The office was more responsible and important than lucrative, and Machiavelli was throughout his life a poor man. The Republic of Florence did not even supply funds for the necessary expenses of the many diplomatic missions upon which he was sent, and these were a heavy drain upon his slender private resources. We have slight glimpses into his family life. He married Marietta Corsini in 1502 and she bore him six children. His principal modern biographer describes him as "of middle height, slender figure, with sparkling eyes, dark hair, rather a small head, a slightly aquiline nose, a tightly closed mouth. All about him bore the impress of a very acute observer and thinker, but not that of one able to wield much influence over others." The position of Machiavelli in public life was a peculiar one. He was never a leader; but he was for many years in positions of trust and responsibility and intimately associated with the most important business of government and with the chief men of the period. He had, therefore, unique opportunities for impartial study of the business of government. The Pisan war laid upon him diplomatic duties, as well as those of commissary of the forces. In the latter capacity he was able to study the system of mercenary military service then in vogue, and thereafter he actively opposed the mercenary system in favor of a national military organization, such as all nations maintain to-day. He spent much time on diplomatic duty at the Court of Cesare Borgia and saw the rise and fall of the power of that master of sinister and conscienceless politics. A study of Cesare's methods, embodied in the essay, *On the Mode of Treating the Rebels in the Val di Chiana,* was the first attempt at a new science of politics. The embassies of Machiavelli also included one to the Emperor Maximilian I., two to Pope Julius II., four to Louis XII. of France, and many to the various Italian States. His letters and papers relating to these constitute an invaluable note-book upon the political conditions of the period.

The Florentine ship of state sailed in troubled waters in the years 1510-12 and soon, deserted by its allies, the Republic was left to fight its battle alone against the exiled Medici, backed by the Papal power. Machiavelli worked with energy for the defense of the city, but with the overthrow of the Republic was involved in the downfall of his friend and patron, the Gonfaloniere Soderini (1512). As the Medici showed great moderation upon their restoration, Machiavelli seems to have entertained hope of returning to his office, the income of which he needed, while the work suited his taste. He was, however, dismissed and banished for a year from the city, but without permission to leave Florentine territory, and put under bonds. It is worthy of note that he was able to render exact and correct accounts upon relinquishing his office. In 1513 he was arrested on suspicion of complicity in the conspiracy of Boscoli and Capponi, but after being put to the torture he was adjudged innocent. Reduced to want and deprived of wholesome activities, he abandoned himself to debauchery and wrote verses and comedies, of which the best known is *Mandragola.* He soon turned, however, to a better task, and wrote his great works on politics—*Il principe* and *Discorsi sopra la prima deca di Tito Livio.* Before 1520 Machiavelli gave the *Prince* its final form, and wrote all that was ever written of the *Discourses* and the seven books on the *Art of War.* Some favor now began to be shown him. He was admitted to the company that gathered in the Oricellari Gardens, and ventured to put forth a *Discourse Touching the Reform of Gov-*

ernment in Florence, advocating the reëstablishment of the Republic. He was commissioned by the directors of the Studio Publico, chiefly through the influence of Cardinal Giulio de' Medici (to whom as Pope Clement VII. the work was dedicated), to write a history of Florence. For this work, the *Istorie fiorentine*, he received a yearly stipend of one hundred florins. He was thus actively engaged in literary work during his later years, and in 1521 he resumed official work for the State, and was again employed on diplomatic missions in Italy. Returning to Florence from one of these absences in May, 1527, he became ill and died, June 22d. His body was buried in the family vault in the Church of Santa Croce, and in 1787, through the efforts of Earl Cowper, a monument was erected to his memory over his tomb.

Machiavelli's life was full of disappointments and he was not one of those idealists who could live above and apart from the things of this world. He was preëminently a man of affairs, whose studies and activities were inseparably connected with human society in its most active phases. It is as a writer upon history, diplomacy, and politics that he holds a high and important place. In this field his position as a man of letters and as a thinker is secure. Here his style is at its best and he imparts to all his work the keen interest that belongs to a direct and vigorous realism. As a historian he is not critical in the treatment of his material, but in other respects he belongs to the modern historical school, his discriminating philosophical method marking a sharp breaking away from the mediæval type of chronicler and a return to the models of the classical historians. His principal historical work was the *History of Florence*, in eight books, beginning with the Germanic invasions and continuing down to the death of Lorenzo de' Medici. More useful, however, to the student to-day are his numerous reports upon his diplomatic missions, and the brief papers on foreign affairs growing out of them. The unfinished *Life of Castruccio Castracani* is of little value.

Aside from the notes on diplomacy and politics contained in his diplomatic papers, Machiavelli's political system is embodied in the *Prince* and the *Discourses*, neither of which is complete without the other. The cynical maxims which abound in them have given the writer an evil reputation which he does not deserve. It must always be remembered that Machiavelli did not discuss ideal, but actual conditions; and drew his deductions from the facts acquired by close observation. He thus became the founder of the modern school of scientific politics. Looking at his system in a large way and eliminating the cynicism which his environment naturally produced, we find that much of what he set forth has been adopted by the soundest political science of to-day. Machiavelli had no faith in aristocracies. He recognized but two forms of government as practicable—absolutism and the democratic republic. The latter was his ideal, but the former he believed to be sometimes necessary. As the first exponent of the idea of a united Italy he showed in the *Prince* how that great end might be brought about by efficient leadership. The *Discourses* elaborate the idea of a republic upon the same fundamental principles. He did not believe that the great ends of government in the upbuilding of the State should be sacrificed to abstract ethics. He was the forerunner of the school of political thinkers who divorce ethics and politics, not because they are necessarily in conflict, but because they are distinct sciences. His system in general is one of policy, resting on the inherent imperfection of men and looking to the balance of conflicting evils. It is in no sense a theoretical political philosophy, though it seems to have such a philosophy in view.

Of Machiavelli's writings only the *Art of War* was printed during his life. A few years after his death the *Discourses*, the *Prince*, and *History of Florence* were printed at Rome with the authorization of Pope Clement VII., but Paul IV. put them on the *Index Expurgatorius*, and this was confirmed by the Council of Trent in 1563. Eight years later the Commission on the Index proposed to Machiavelli's descendants to publish an expurgated edition, the author's name being suppressed. This offer was rejected. In 1772 a partial edition in three volumes was published in London; and in 1782 Earl Cowper published a four-volume edition at his own cost. They were not published in Italy until the nineteenth century, when the Milan (1810-11) and the *Italia* (1813) editions appeared. A new edition was begun in 1873 by Passerini and Milanesi, but was not completed. An admirable English translation of the historical, diplomatic, and political writings is that of Detmold, *The Writings of Niccolò Machiavelli* (Boston, 1891). The best biography and commentary on his place in history is Villari, *Niccolò Machiavelli e i suoi tempi* (1877-82; Eng. trans. by Linde Villari, London, 1892). See also Mourrisson, *Machiavel* (Paris, 1883); Tommasini, *La vita e gli scritti di Niccolò Machiavelli* (Turin, 1882). The *Prince* is published in numerous editions in Italian, English, and other languages; for literature relating to it, see Mohl, *Geschichte und Litteratur der Staatswissenschaft* (Erlangen, 1855-58).

MACHIM, măk'ĭm, Robert. The name given in a romantic story to an Englishman who fled from England to France with his lady-love, Anna d'Arfet, in 1346. The lovers were driven from their course by a storm and were cast ashore on the island of Madeira, where they founded a town called Machico. The island appears, however, to have been discovered at a much earlier date.

MACHINE, MACHINERY (in engineering). See Mechanical Powers—Machines; Metal-Working Machinery; Wood-Working Machinery; etc.

MACHINE ENGRAVING. A process involving the use of a machine to engrave wood, metal, or stone. Machinery has been devised which will carry on many of the manual operations of an engraver and produce regular tints, geometrical designs, and other symmetrical patterns with greater accuracy and far more rapidity than would be possible by hand work. The first machine of this description was invented by Wilson Lowry, and was known as a ruling machine, being employed to engrave such mechanical features of a plate as the plain background, skies, etc. In most machines for engraving, the tool is so arranged that after each cut it can be moved a certain definite amount so that at the next stroke a parallel line is cut at a regular distance from the last. In wood-engraving the breadth of the tool, or the depth to which it is allowed to cut, regulates the distance between the lines and the nature of the tint. For metal work the machine may be fitted with a highly tempered steel cutting tool, though in the case of engraving copper plates the latter are usually coated with varnish which is scratched by the tool and subsequently etched by acid. In the latter case the intensity of the action of the acid will regulate the thickness of the lines. When it is necessary to engrave on stone with a machine, the cutting tool has a diamond point, and the depth of the cut is regulated by means of weights on the tool-holder. The most complex engraving is executed wholly by machinery; and is employed in the manufacture of bank-notes, bonds, stock certificates, and other papers which it is necessary to protect with a peculiar and individual pattern. By an elaborate system of gearing the cutting tool so moves that it will execute a certain number of symmetrical motions and thus produce elaborate geometrical scrolls and patterns. On such a machine it is possible to make many combinations of figures for a pattern, but it is impossible to reproduce any given design once it has been traced. See BANK-NOTES, MANUFACTURE OF.

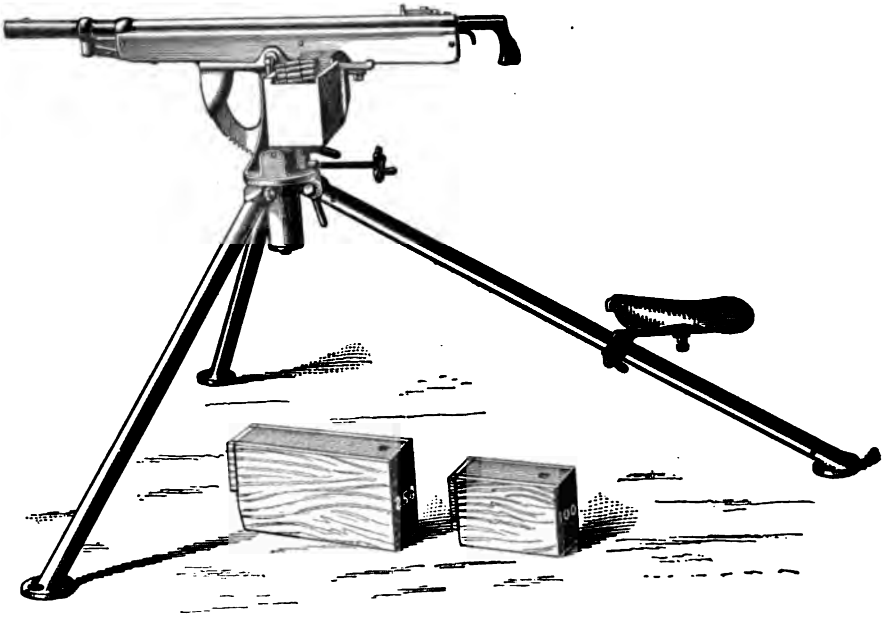
MACHINE GUN (Fr. *machine*, from Lat. *machina*, from Gk. μηχανή, *mēchanē*, device). A gun in which the operations of loading, extraction, and firing are wholly or partly performed by mechanism. The early history of machine guns is involved in the same mystery that surrounds the development of guns and gunpowder. The breech-loader and the revolver are found almost as far back as we can trace the portable gun; even farther back there is evidence of attempts to produce multiple-firing guns. At the Boston Navy Yard there is a double-barreled bronze gun of Chinese manufacture which was captured in Korea in 1870. According to the Chinese inscription upon it, it was made in 1607. It is about 18 inches long and weighs 14 pounds. It has three reënforcing bands about the breech end of each barrel, and each band has a vent in it. It was therefore arranged to fire in succession three shots from each barrel, the spaces between the vents being ample for the powder, ball, and wads. Pepys in his diary, date of July 3, 1662, says: "After dinner was brought to Sir W. Compton a gun to discharge seven times, the best of all devices that ever I saw, and very serviceable, and not a bauble, for it is much approved of and many thereof made." From 1662 to 1861 there are found frequent references to guns designed for multiple loading, but none seemed to give sufficient satisfaction to gain a permanent place in armaments. The success of the machine gun awaited the development of metal-cased fixed ammunition which appeared (as a military store) during the Civil War and was immediately followed by magazine and repeating small arms and numerous kinds of machine guns. Of these early pieces the best was undoubtedly the Gatling, though the Nordenfeldt gun gave good satisfaction as a ship's gun. The French mitrailleuse never was very successful; it appeared after the Gatling was practically perfected, but was much inferior to it and owes its reputation to fanciful descriptions of some newspaper correspondents who were ignorant of its actual performance. The first machine gun of a calibre larger than that of small arms was the Hotchkiss revolving cannon. This was invented by Mr. B. B. Hotchkiss, an American residing in France, in 1887, in response to the call of the French naval officers, who wanted a rapid-firing weapon of larger calibre as a defense against torpedo boats. These guns were at first 1-pounders, as under the rules of war this is the lightest explosive shell; they were afterwards made to fire 6-pound shells, but were very cumbersome and were replaced five years later by rapid-firing single-shot weapons. The Maxim-Nordenfeldt automatic 1-pounder was first used in the Spanish-American War, but it was brought out a year or two earlier; it is a development of Sir Hiram Maxim's smaller automatic gun brought out ten years or more before.

Machine guns may be divided into two classes: (a) those operated by hand-power or exterior force; and (b) those operated by the force of the powder gases acting directly upon a piston or through the recoil of the barrel. Representative of the first class are the Gatling and Gardner guns, and Hotchkiss revolving cannon, which are not very different in general character, and the Nordenfeldt, which more closely resembles the early forms of mitrailleuse. In the latter the barrels, three or more in number, have their axes in the same horizontal plane, and are fired by a horizontal lever, one after the other, but so rapidly that the piece is included among the so-called *volley-firing* guns.

A description of the Gatling will serve as an illustration of the principle upon which most of the guns of Class A were designed. It was invented by Dr. R. J. Gatling, of Indianapolis, Ind., in 1861, and in 1862 he had a battery constructed and in working order, an accomplishment which certainly preceded the appearance of the French mitrailleuse. The gun consists of a series of parallel barrels, usually ten, in common with a grooved carrier and lock cylinder, the whole rigidly secured upon a main shaft. It has as many grooves in the carrier and as many holes in the lock cylinder as there are barrels. Each barrel has one lock, so that a gun with ten barrels has ten locks. The operation of the gun is very simple; one man places one end of a feed case filled with cartridges into the hopper, while a second man turns the crank which by the agency of the gearing revolves the main shaft. As the gun is revolved, the separate cartridges drop into the grooves of the carrier from the feed cases and are pressed home ready for discharge. When first invented, the Gatling gun differed radically both in principle and action from any form of gun previously in use, and admitted of faster discharges and heavier projectiles, besides which, its method of fire prevented the accumulation of recoil. Improvements and alterations in the gun have been largely in the direction of an improved feed case.

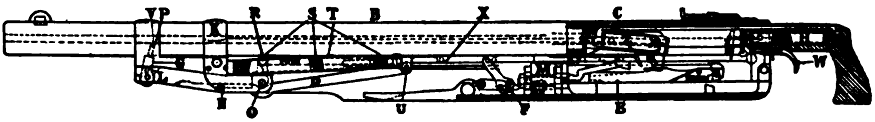
The objections to the original tin feed case were that it worked irregularly for different angles of elevation, and that the cartridges did not always fall in their proper position in the grooves, with the consequence that jamming frequently occurred. The 'Bruce Feed' was designed to remedy this last defect. It was constructed on the gravity principle, and consisted of an upright bronze standard to which was attached a swinging piece containing two grooves, beneath which was an opening, which in turn connected with a wheel turning freely on its own axis. In action, the cartridges were fed into the opening of the breech cases above the carrier block, where they became engaged in the grooves of the swinging piece, and passed directly into the fixed mouth, so that as each cartridge made contact with the wheel the latter was made to revolve by its impact and pressure and thus present the next groove for the next cartridge. As the wheel turned round it carried and deposited the carriages in the grooves of the carrier block ready for discharge. The device answered its purpose with regard to the avoidance of jamming, but was as variable and uncertain so far as regards the different angles of elevation as was the old tin case.

The 'Accles' feed drum was designed to obviate this difficulty, and as it fed the gun without the aid of gravity, being in effect a positive feeder, it was independent of the angle of elevation. The invention consisted of a two-headed drum, connected by a sheet-brass casing, the heads also being of brass, and the distance between the two equal in length to that of a cartridge. Each head was grooved in a spiral form. The cartridges are inserted in the drum through the mouth and rest in the spirals and between the radial arms. To fire the gun, the feed drum is inserted in position directly over the carrier block, the opening of the drum resting over the grooves of the block with the planes of its heads in position with the axis of the barrels. The movement or rotation of the crank causes the lock cylinder, barrels, etc., to revolve; and at the same time the groove projections of the carrier block force the radial arms of the drum to rotate. The great objection to this device was that while the feed was perfectly regulated, causing no deviations of elevation, yet the weight of the drum was a serious drawback, besides which, a bullet striking its exposed surface instantly put it out of action. To avoid this very serious defect, a feed has been introduced which leaves but a small surface exposed to fire and is in other respects entirely free from the defects of its predecessors. Long strips of some cheap flexible metal, tin preferably, having tongues or slits (one end of each of the former attached to the strips, while the other is separated, and so surround the cartridge as to keep it in position on the strip), are fed into the opening of the hopper. The rotation of the crank compels the projections on the grooves of the carrier block acting upon the cartridges to force the strip through the hopper. Thus each cartridge is in turn deposited in the groove of the carrier block, the empty strips being discharged to the right. The Gatling gun with improved feed has attained a rate of fire about 20 rounds a second.



COLT AUTOMATIC GUN.

The Gardner gun closely resembles the Gatling so far as regards the principle of rapid fire. It consists of two barrels parallel to each other and having their axis in the same horizontal plane. Its component parts other than the barrels are: the casing, bolts, firing, and extracting mechanism, cams, and feed valve and guide. The casing is of bronze and forms a support as well as protection for the barrels. A current of air is caused to circulate around the barrels by means of two openings made in the top and bottom. The rear part of the casing (box-shaped) contains the mechanism. The two U-shaped bolts (one for each barrel) have a backward and forward movement in the casing. The firing and extracting mechanism is both simple and ingenious, the feed valve and guide closely resembling the Bruce guide already explained in connection with the Gatling gun, except that it is without a wheel and is attached to the casing in the rear of the barrels. It is so arranged as to cause the cartridges to drop from the feed guide through the holes in the casing and from thence into the chamber, into which it is forced by the bolt. This action opens the other barrel, which is loaded in turn, and so on until the ammunition is exhausted.



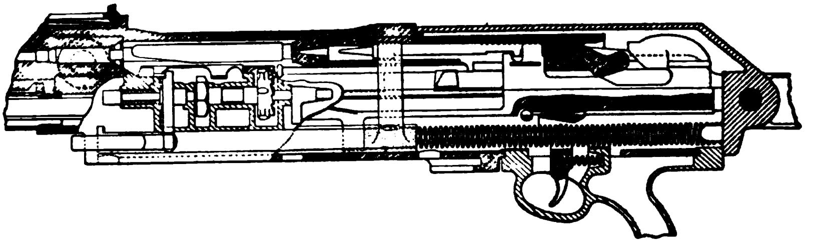
DETAIL OF COLT AUTOMATIC GUN.

B, barrel; C, breech casing; D, operating rod; E, carrier which lifts cartridge in front of breech bolt; F, feed mechanism: G, gas cylinder in which gas-piston (P) fits; H, hammer; K, band around barrel carrying double lugs in which is pivot of gas lever (L); L, gas lever which is made to vibrate and operate mechanism; M, opening in casing for feed belt; N, pivot of operating rod (D) on gas lever; O, gas lever pivot in lugs of band (K); P, gas piston against which powder gas acts; R, short arm on end of gas lever (L) to which are attached springs (S) to return (L) to position after firing; S, springs to keep gas lever up; U, pivot of operating rod; V, vent through which gas escapes; W, trigger; X, sliding bar which works breech bolt, feed mechanism, and carrier; Z, breech bolt.

HOTCHKISS RIFLE-CALIBRE AUTOMATIC GUN ON TRIPOD.

The guns of Class B that are now in use are (1) fully automatic, or (2) semi-automatic. A gun is not automatic if it is operated by the rotation of spindle worked by hand, clockwork, or by motor; for the evident reason that the operating power is obtained from an outside or external source. But, if the power is derived from the explosion of a preceding cartridge, the gun would come under the heading of automatic machine guns, and thus be differentiated from those operated by a crank worked by hand, or a 'motor machine gun' worked by an electric or other motor. The term semi-automatic when applied to ordnance is used to denote any gun in which the functions necessary to its employment are performed partly automatically and partly by external agents. The fully automatic guns may be divided into (1a) those operated by the powder gas acting upon a piston, and (1b) those operated by the recoil of the barrel or other parts when the piece is fired. All semi-automatic pieces so far produced are operated by the recoil of the barrel or moving parts. The fully automatic guns of the 1a class are very numerous, but those best known are the Colt (Browning's patent), Hotchkiss, and Yamanouchi (Japanese). The mechanism of the Colt gun is driven by the action of a vibrating lever which is pivoted on the gun and has a short cylindrical lug at its forward end resting in a socket in the casing and covering a hole in the barrel near the muzzle. When the bullet passes beyond the hole in the barrel the pressure of the powder gas acting on the lug throws it back with force sufficient to give power to carry on all the operations of loading and firing. The gun has no water jacket, but the barrel is very heavy (more than an inch in diameter). The cartridges are fed in a belt of woven cotton which carries 250; additional belts may be placed in position with the loss of but a few seconds' time. The gun used in the United States Navy has a calibre of 0.236 or 0.30 inch, and weighs 40 to 42 pounds. It is usually mounted on the ship's rail or on the rail of a top. For service in the field a tripod mount weighing 50.25 pounds is supplied. The speed of fire is about 300 rounds per minute, but, owing to the necessity of changing the belt, about 250 is the practical limit. The Hotchkiss and Yamanouchi guns differ from the Colt chiefly in the method of utilizing the pressure of the powder gas. Instead of pressing against a vibrating lever, the powder gas escapes from the hole in the barrel into the end of a cylinder underneath and presses back a piston which works the mechanism. As soon as the bullet leaves the muzzle the pressure against the piston is removed and it is free to come forward again and is returned by the action of a spring. The guns of the (1b) type are quite numerous, but the Maxim automatic gun, the Maxim-Nordenfeldt automatic 1-pounder, to which the name of Pompom was given in the British-Boer War (1899-1902), the Dawson-Silverman (Vickers) automatic 3-pounder, and the Skoda automatic gun are well known. In all except the Dawson-Silverman 3-pounder the recoiling barrel or breech-lock drives a train of mechanism and the pieces are loaded from a belt; in this 3-pounder the ammunition is placed in a hopper over the breech from which the cartridges fall into place by gravity, when the breech is open and empty, and are driven forward into the breech by a lug on the loading types, the Maxim-Nordenfeldt, Driggs, Armstrong, etc. Of these the first is by far the best known. It is adopted in the United States Navy and is the only semi-automatic gun used in any naval service. After the gun is fired the barrel recoils, compressing certain springs by which it is pushed to the front again. As it moves to the front the breech-lock is forced downward and the extractors eject the empty cartridge case and then hold the breech-block open; the loader inserts the fresh cartridge, which trips the extractors as it slips into the bore and allows the breech-lock to rise and close the breech ready for firing. This semi-automatic mechanism is applied to guns which are considered too heavy for machine-gun mechanism; in the United States Navy it has been adopted for use in 3-inch (13-pounder) and 6-pounder (2.24-inch) guns.

Machine guns are used on all modern men-of-war, but the importance of the smaller ones has decreased with the improvement in the rate of fire of larger pieces, the probable increase of battle ranges, and the improvements in torpedoes and torpedo boats. To stop a torpedo boat, or to so disable her as to render it impossible to proceed with the attack, is beyond the probable power of even a 6-pounder. Shrapnel from guns of 3-inch calibre and over are considered by many authorities the best defense against torpedo-boat attack.


HOTCHKISS RIFLE-CALIBRE AUTOMATIC GUN, LONGITUDINAL SECTION.

In shallow-draught vessels and boats operating at close range in rivers and contracted waters, machine guns of small calibre do great service. In several cases during the Philippine insurrection machine guns in boats and on the small gunboats have driven off the enemy and prevented the loss of many men. The value of the larger calibres is less pronounced. The effect of the bursting of a 1-pounder shell is very slight—against a ship it is nothing. The idea that an automatic gun can be 'handled like a hose' is fallacious. The jerk of the recoil is so rapid and violent that aiming the smallest automatic pieces is well-nigh impossible, while the automatic 1-pounder jumps so powerfully that good shooting even at the shortest ranges is out of the question. The larger machine guns, however, are so fitted that they may be fired singly at the will of the operator, and this is probably the best way to use them. Very rapid-firing machine guns of large calibre must have the weights and moments of the moving parts balanced about the axis of the bore; if not, the jump will prevent accurate shooting and compel a resort to single shot firing.

The general question of the method of employment, organization, etc., of machine gun units is one of the problems of modern military science. Unlike the field gun and heavy ordnance generally, the machine gun cannot be used against field works, fortifications, etc., and only in a limited sense and under rare circumstances against the defenders of such defenses. Since the Franco-German War of 1871 the French have constantly fostered the machine-gun arm of their services both naval and military, although the practical results of the mitrailleuse in the campaign mentioned were not by any means what French military opinion had been led to expect. Machine guns were used by the English in their various Egyptian and Indian frontier expeditions with considerable advantage, although in the earlier Egyptian campaigns their value was sometimes a doubtful quantity, owing to the ease with which the guns became jammed, whether through defective feed, a too delicate mechanism, or the presence of sand, dust, etc. In the British-Boer War of 1899-1902 every modern form of machine and automatic gun was employed, but the conditions were such that nothing very definite could be arrived at regarding their future method of employment. It was found, however, that although they had not the moral value with an enemy that the regular field gun and shell seemed to have, yet they exercised a moral influence peculiar to themselves. It frequently happened that the noise of the Pom-pom (q.v.) in action had, if anything, a more demoralizing influence than the bursting of shrapnel shell. The organization of machine-gun details differs in nearly every country. In America and England they are attached to regiments of cavalry and infantry, while in Germany there is a machine-gun attachment for each army corps with a personnel of 3 officers, 9 commissioned officers, 58 privates, and 43 horses. The detachment consists of 6 guns and 2 ammunition wagons which are grouped in battery. Whether this system is preferable to the detailing of one or more guns with each regimental unit had not, in 1903, been finally settled. The advantage of machine guns to an army in the field lies in the fact of their great mobility. At the best they are an auxiliary to, and not by any means a substitute for, the regular field battery.

For further information, consult: *Annual Reports of the Office of Naval Intelligence*, U. S. Navy Department; *Proceedings of the United States Naval Institute; Annual Reports of the Chiefs of Ordnance, U. S. Navy; Annual Reports of the Chiefs of Ordnance, United States Army;* Ingersoll, *Text-book on Ordnance and Gunnery*

(Annapolis, 1899); Bruff, *Ordnance and Gunnery* (New York, 1900); *Arms and Explosives* (monthly, London).

MACHINERY, Economic Effects of. The extension of machinery in modern production has given rise to a controversy as to its economic significance. The opposing attitudes may be said to spring from a difference in the point of view, those who defend machinery looking upon it chiefly from the standpoint of production, while the opposing party emphasizes its effects in distribution.

From the viewpoint of production the economic ideal is the maximum production of goods for the satisfaction of human wants. The machine enhances production by saving labor, but the real significance of labor-saving is that with like quantities of human labor far greater results can be obtained by the use of machinery than without it. The emphasis which has been laid in the discussion upon labor-saving rather than upon increased production has seemed to give a point of vantage to the opponent of machinery, who asks why mankind is benefited when labor, upon which the majority rely for their subsistence, is saved. It should, therefore, be understood that increased production is always involved in labor-saving when the benefits of labor-saving are discussed.

How machinery has multiplied the productive power of labor is a story that has been frequently told. For an exhaustive treatment of this aspect of the subject, the reader may be referred to the *Thirteenth Annual Report* (1898) of the United States Department of Labor on Hand and Machine Labor, in which no less than 672 examples of labor-saving by the use of machinery are set forth. A study of this report will correct any misapprehension that this growth has been sudden. In many cases the data for hand and machine labor are almost contemporaneous, while in others the data for hand labor refer to very much earlier periods. An examination of the detailed tables will show that in the manufacture of like products, in some establishments, certain operations are performed by hand which are performed by machinery in others. It will show also just what operations in the aggregate process of bringing the goods to a completion have been affected by mechanical improvements and what remain for manual labor.

Countries bound by tradition and custom are slow to accept improvements, and even among the more advanced nations there is great inertia to be overcome. Nowhere has the utilization of perfected processes and mechanical appliances of all kinds been more rapid than in the United States. Elsewhere plants are only slowly reconstructed to meet the technical improvements, largely because of the considerable investment of capital in the older processes. But in the United States the spur of necessity has been greater because of the constant expansion of industry and the competition of new plants with old, which has forced the latter to keep up to the mark in their technical processes. A relative scarcity of labor as compared not alone with the industrial but also the agricultural possibilities of the United States has been a powerful spur to labor-saving. In the period which gave its stamp to our economic development labor was the most costly element in the production of goods, and to the economizing of this element every effort was bent.

Thus far our attention has been directed to machinery and its application as a factor in the production of wealth. There is another side to the question, namely, its effects upon the laboring classes. The contention against machinery has been that it throws men out of employment, that it degrades labor and destroys all artistic elements of production. The introduction of labor-saving machinery almost inevitably throws men out of work, the machine taking their places. The persons thus displaced must, as a rule, seek employment elsewhere. It is possible that such an impetus will be given to the industry that there will be room for the employment of all who were previously at work, but this is not probable in the first instance. It is not likely that there will be an immediate expansion of the demand for the product commensurate with the increased facilities of production, without reducing the labor force. In the long run the industry will generally develop so as to afford even wider opportunities for employment than before. But the process takes time, and meanwhile the laborer must either starve or find employment elsewhere. Moreover it is by no means certain that when the enhanced demand for labor occurs in the employment from which machinery had driven the workman, the same kind of labor as that which has been displaced will be needed. The skill which the laborer has acquired in his calling may no longer be in demand, and he may have to apply himself to something else for which he is less fitted and in which he can render service of an inferior grade only. That these changes in industry involve great hardships for individuals cannot be denied. It is vain to point out that the demand for labor in general is probably not diminished, that industries increase, and that new industries are created by inventions and machinery. It was of little consequence to the weaver who was thrown out of employment by the power loom, that the workshops in which the machinery was manufactured had an increased demand for machinists. Little as we can doubt that an industrial community eventually adjusts itself to such changes, just as little can we doubt that they press hard upon the individuals who are immediately affected by them.

The most that can be said in answer to the foregoing argument is that there are mitigating circumstances which have been overlooked. In the first place, industrial changes are not abrupt; they are evolutionary rather than revolutionary. They do not affect large bodies of workmen at once. Invention proceeds by slow movements, and the introduction of improved processes is not simultaneous throughout an industry. Furthermore, the division of labor which prevails when machinery is employed reduces processes to comparatively simple elements and creates analogous processes in branches of production which are apparently widely dissimilar. This facilitates in a high degree the passage from one employment to another. All of these things do not remove the evils for the individual of industrial changes, but they mitigate their severity.

Much more serious is the charge that machinery degrades the laborer, and makes him a mere part of the mechanism. It is charged that the monotony of the operations deadens the intellect, while the stress and strain of the labor which must keep pace with the machinery impairs the body and weakens vitality. The early history of manufacturing in England seemed to bear out these assertions, and the well-authenticated pictures of the misery and suffering in the manufacturing districts lend a sombre color to the history of the first half of the nineteenth century. But factory legislation has done much to remove the evils complained of, and there is no convincing evidence of permanent deterioration.

Akin to this objection to machinery is the claim that in doing away with the old handicrafts, art in industry was abolished. The old artisan was the master of a series of operations which culminated in the finished product. The modern workman knows but a part of the work and the old skill has passed away. The artisan, it is said, has been degraded into a mere laborer. But the assertion is too general. While operations changed there was still room for the better craftsman. He rose to the work of superintendence, becoming the foreman or overseer of the new system. The poorer craftsmen undoubtedly sank to the position of workmen, but to lose a poor carpenter and obtain a good hand in a planing mill is probably no loss to the community at large. Moreover, as the gap between skilled and unskilled labor was no longer as wide as of old, there has probably been an uplifting of the general character of labor performed. As to the artistic side of production, it may have seemed at one time that machinery was eliminating this factor, but in view of recent developments this cannot be stated as a present tendency. With the perfection of machinery and the widespread use of manufactured products the artistic element has reasserted itself, and it is probable that artistic forms are more widely diffused in common life than they ever were before. Finally, it is to be borne in mind that the lowering in prices which results from the introduction of machinery frequently means an increase in the real wages of the laborers not immediately affected by the change. The simultaneous introduction of machinery in all of the principal industries might conceivably lower wages, estimated in money, while leaving unchanged the quantity of commodities which the laborer can command. What is of supreme importance, however, is the fact that the increased productivity of industry creates a fund of wealth out of which higher wages for shorter hours may eventually be obtained. However disastrous mechanical inventions may be for particular workmen, it can hardly be doubted that it will be through such inventions that the laboring class will eventually be relieved from the worst conditions of the present day.

Consult: *Reports of the United States Department of Labor;* Wright, *The Industrial Evolution of the United States* (New York, 1895); Nicholson, *The Influence of Machinery upon Wages* (new ed., London, 1892).

MACHINE TOOLS. See METAL-WORKING MACHINERY.

MACHO, mä'chō (Sp., male), **MACHUTO.** A West Indian name of the 'common' mullet (*Mugil cephalus*). See MULLET.

MACHPELAH, măk-pē'lȧ, CAVE OF. A cave at Hebron, the traditional burial place of the patriarchs. On its site stands a magnificent mosque, access to which is strictly denied to Christians.

MACHUELO, mä'chōō-ā'lō (Sp., diminutive of *macho*, male). The West Indian name of the thread herring (q.v.). A closely related species (*Opisthonema libertate*) is known in Central America as 'Sardinia machete.'

MACIEJOWICE, mȧ'chȧ-yō-vĭt'sĕ. A village of Russian Poland, in the Government of Siedlce, near the right bank of the Vistula. It is noted for the battle fought there on October 10, 1794, in which the Polish patriots under Kosciuszko succumbed to the Russians, commanded by Suvaroff and Fersen.

McILHEN'NEY, CHARLES MORGAN (1858-1904). An American landscape painter, born in Philadelphia, Pa. He studied under Briscoe and at the Pennsylvania Academy of Fine Arts. His landscapes are treated with quiet color and much feeling. They include "A Gray Summer Noon" (1884) and "The Passing Storm" (1887). He won the first Hallgarten prize in 1893, medals at the Columbian Exposition of 1893, and honorable mention at the Paris Exposition.

McILVAINE, măk'ĭl-vān', CHARLES PETTIT (1799-1873). An American bishop of the Protestant Episcopal Church. He was born in Burlington, N. J., graduated at Princeton in 1816, was ordained minister in 1821, and had charge of Christ Church, Georgetown, D. C., for five years. From 1825 to 1827 he was chaplain and professor of ethics and history in the Military Academy at West Point. From 1827 to 1832 he was rector of Saint Ann's Church, Brooklyn, N. Y., and in 1831 was chosen professor of ethics and revealed religion in the University of the City of New York. He was consecrated Bishop of Ohio in 1832, and also held the position of president of Kenyon College at Gambier in that State from 1832 to 1840, and afterwards of the theological seminary there. During the Civil War he was a member of the United States Sanitary Commission, and, visiting Europe, publicly defended the national cause. Among his published writings are: *Lectures on the Evidences of Christianity* (1832); *The Holy Catholic Church* (1844); *The Truth and the Life* (1855).

McINTOSH, măk'ĭn-tŏsh, LACHLAN (1725-1806). An American soldier. He was born near Raits, Badenoch, Scotland, and was a son of John More McIntosh, who went to Georgia in 1736. Lachlan entered the mercantile house of Henry Laurens at Charleston, but was afterwards a land surveyor. At the beginning of the Revolutionary War he was colonel of the First Georgia Battalion, and in 1776 was made a brigadier-general. In 1777 he killed ex-Governor Button Gwinnett in a duel. He was selected by Washington to lead an expedition against the Western Indians in 1778; was present at the siege of Savannah the next year; and was taken prisoner at the capture of Charleston in 1780. He was a member of the Continental Congress in 1784.

McINTOSH, MARIA JANE (1803-78). An American author, born in Georgia. She removed to New York City, and having lost her fortune in the panic of 1837, undertook authorship as a means of support by publishing in 1841, under the pseudonym 'Aunt Kitty,' a juvenile story, *Blind Alice*. This was followed by other tales, all republished in London. Subsequent works, written for adults, were *Two Lives, or to Seem and to Be* (1846); *Charms and Counter Charms* (1848);

The Lofty and the Lowly (1852), a story of plantation life; *Meta Gray* (1858); *Two Pictures* (1863).

MacIVOR, măk-ē′vẽr, Flora. The heroine of Scott's *Waverley*, and sister of the Scottish chieftain Fergus MacIvor, after whose death she withdraws to a convent.

MACK, măk, Karl, Baron Mack von Leiberich, Baron (1752-1828). An Austrian general. He was born at Nennslingen in Franconia, and in 1770 entered the Austrian military service. He fought bravely against the Turks and by 1797 had attained the rank of field marshal. In the winter of that year he assumed the command of the Neapolitan troops against the French, but met with small success and was forced by a popular uprising to give himself up to the enemy. In 1805, on the outbreak of war between Austria and the French Emperor, he pressed into Southern Germany at the head of an army of 80,000 men, but was decisively beaten on the river Iller (October 14th-15th) and threw himself into a trap at Ulm (q.v.), where he was forced to surrender on the 17th with 23,000 men. Returning to Austria, he suffered the loss of his rank and was imprisoned for two years.

MACKAU, mȧ′kō′, Ange Ferdinand Armand, Baron de (1832—). A French politician, born in Paris. He became auditor of the Council of State in 1853, and in 1866 was elected a Deputy from Orne to the Corps Législatif, where he took his seat on the right. He voted for the war against Prussia, and after the fall of the Empire retired from politics until 1876, when he was elected to the Chamber of Deputies from Argentan and thereafter was constantly reëlected. He was a Bonapartist, a supporter of Boulanger and of the clergy. In 1892, however, he announced a complete change in his political opinions. In response to the will of his countrymen as manifested in the last election, he declared himself in favor of the Republic and of the Constitution. This announcement created a great stir at the time. He published *Commentaire de la loi du 18 Juillet 1868 sur les chemins vicinaux* (1868) and *Le projet de loi Ferry devant les Conseils généraux* (1879).

MACKAY, m'-kī′, Charles (1814-89). An English poet and journalist; born in Perth, March 27, 1814; educated at the Caledonian Asylum, London, and at a school in Brussels. After serving as secretary to William Cockerill, near Liège, he returned to London (1832). Mackay became assistant editor of the London *Morning Chronicle* (1835-44); editor of the Glasgow *Argus* (1844-47); editor of the *Illustrated London News* (1852-58); started the London *Review* (1860) and *Robin Goodfellow* (1861), neither of which was successful; and was a New York correspondent for the London *Times* during the Civil War (1862-65). He died in London, December 24, 1889. Mackay became widely known for his songs, among which are: "Cheer, Boys! Cheer!" and "There's a Land, a Dear Land." From his pen appeared, in all, fourteen volumes of verse, beginning with *Songs and Poems* (1834) and closing with the posthumous *Gossamer and Snowdrift* (1890). He also published two novels, *Longbeard* (1841) and *Luck, and What Came of It* (1881), and much miscellaneous prose, as *Memoirs of Extraordinary Popular Delusions* (1841); *The Gaelic and Celtic Etymology of the Languages of Western Europe* (1877); *A Dictionary of Lowland Scotch* (1888); and literary reminiscences under the titles, *Forty Years' Recollections* (1878) and *Through the Long Day* (1887).

McKAY, Donald (1810-80). An American shipbuilder. He was born in Nova Scotia, learned the trade of shipbuilder in New York, and went into the business in Newburyport, Mass. In 1845 he established at East Boston a shipyard that became famous for the improvements introduced in the models of large clipper trading ships. In 1853 he produced the ship *Great Republic* of 4500 tons burden, which, for a time, was the largest in the world.

MACKAY, Eric (1851-98). An English poet, a son of Charles Mackay (q.v.), born in London, January 25, 1851. He was educated in Scotland, and subsequently passed several years in Italy. He died June 2, 1898. As a poet Mackay was distinguished for his artistic handling of lyrical rhythms, notably in *Love-Letters of a Violinist* (1886) and *A Lover's Litanies* (1888). He also made a very fine dramatic study in *Nero and Actæa* (1891). Among his other volumes of verse are *Gladys the Singer* (1887); *Song of the Flag, a Nationad Ode* (1892); *My Lady of Dreams* (1895); *Arrows of Song* (3d ed. 1896); and *A Lover's Missal* (1898).

MACKAY, John William (1831-1902). An American capitalist, born in Dublin, Ireland. He came to New York City when he was a boy and learned the shipbuilder's trade. In 1851 he went to California and in 1852 to Nevada, where he secured a two-fifths share in the Bonanza mines of the Comstock Lode. He was disappointed again and again; then grew rich; and then as he was about to give up working the lode, a rich vein which produced more than a hundred millions was disclosed. With Flood, Fair, and O'Brien, his partners in this mine, he formed the Nevada Bank, and was long its president, but withdrew his capital after Flood's disastrous attempt to corner wheat. In 1884, largely because of enmity to Jay Gould, he formed with James Gordon Bennett the Commercial Cable Company and the Postal Telegraph Company to fight the Western Union; laid the cable in spite of many difficulties, and fought a long fight with the old cable lines, which cut the rate to 12 cents a word in a vain attempt to force Mackay out. Mackay died in London as the result of prostration by heat.

MACKAYE, m'-kī′, James Steele (1842-94). An American dramatist, born in Buffalo. He studied dramatic expression in Paris under François Delsarte, and on his return to America lectured in New York City and Boston. His two plays, *Monaldi* and *Marriage*, written about this time, were produced at the Saint James Theatre in New York City. He afterwards toured in England as an actor, and played Hamlet in London, where he collaborated in several well-known plays. His other works include: *The Twins* (1876); *Won at Last* (1877); *Through the Dark* (1878, later called *Money Mad*); *Hazel Kirke* (1880); and *Anarchy* (1887, later called *Paul Kauvar*).

McKEAN′, Thomas (1734-1817). An American patriot and politician, signer of the Declaration of Independence. He was born at New London, Chester County, Pa., of Irish parentage, and was educated privately at New Castle, Del., where he settled. He studied law, was admitted to the Delaware bar in 1755, was immediately appointed register of probate, and in 1756 became assistant attorney for Sussex County. From 1757 to 1759 he was clerk of the Delaware Assembly, and in 1762 was commissioned with Cæsar Rodney (q.v.) to revise all the laws of Delaware passed prior to 1752. In the same year he began his long service as a member of the Delaware Assembly, where he served continuously by reëlection until 1779. In 1765 he was elected to the Stamp Act Congress (see Stamp Act), where he was instrumental in securing an equal vote for each of the provinces represented and assisted in drawing up the memorial to Parliament. He was elected in the same year a judge of the Common Pleas, and boldly ruled that only unstamped paper should be used in his court. In 1771 he was collector of the port of New Castle, and about the same time opened an office for the practice of law in Philadelphia. He continued to reside for part of the time in Delaware, however, and in 1774 was elected a delegate from that province to the Continental Congress. In the proceedings of that body he took a leading part, serving until 1783 and being the only member sitting continuously throughout the war. He favored the adoption of the Declaration of Independence, and, though absent when that document was signed, he was later (probably in 1784) allowed to affix his signature. He also helped to draft the Articles of Confederation, which he signed. In 1781 he was president of Congress. While still a member of the Delaware Assembly, and one of the Delaware delegates in Congress, he became prominently identified with Pennsylvania affairs, was chairman of the Committee of Safety in that State in 1776, and in 1777 was chosen Chief Justice, a position which he held until 1799. In the latter year, having become one of the leaders of the Republican Party, and a strong supporter of Jefferson, he was elected Governor of Pennsylvania, serving until 1808. With James Wilson he was the author of *Commentaries on the Constitution of the United States* (1790).

McKEESPORT, m'-kēs'pōrt. A city in Allegheny County, Pa., 15 miles southeast of Pittsburg; at the confluence of the Monongahela and Youghiogheny rivers, both of which are navigable, and on the Baltimore and Ohio, the Pennsylvania, and the Pittsburg and Lake Erie railroads (Map: Pennsylvania, B 3). It is in the heart of the natural gas and the bituminous coal regions of the State, and is the seat of a vast iron and steel industry, the plant of the National Tube Works, which alone employs 8500 men, being one of the largest in the world. Other manufactures are railroad cars, locomotives and supplies, glass, and lumber. There is a large trade in coal and lumber. The city has the Douglass Industrial College, McKeesport Hospital, Carnegie Library, Young Men's Christian Association Hall, a fine high school building (cost $168,000), and several bridges that are of interest architecturally. The government is vested in a mayor, elected every three years; a bicameral council; and administrative officials as follows: police, street commissioner, and board of health, appointed by the mayor with the consent of the council; water commissioners, city solicitor, and chief of fire department, elected by the council; and treasurer, comptroller, board of assessors, and school board, chosen by popular election. The principal items of annual expenditure are about $155,000 for schools, $35,000 for the fire department, $55,000 for the police department, and $55,000 for the water-works, which are owned and operated by the city, having been built in 1882 at a cost of about $425,000. Settled in 1795 and named in honor of John McKee, its founder, McKeesport was incorporated as a borough in 1842. Until 1830, when coal-mining began in the district, it was a straggling village. Population, in 1890, 20,741; in 1900, 34,227.

McKEES ROCKS. A borough in Allegheny County, Pa., on the Ohio River, opposite Allegheny, and on the Pittsburg and Lake Erie and the Pittsburg, Chartiers and Youghiogheny railroads (Map: Pennsylvania, A 3). It is known for its extensive iron and steel interests, and there are also railroad machine shops, and manufactories of glass, lumber, flour, etc. The rapid growth of its population is shown as follows: in 1890, 1687; in 1900, 6352.

MacKEL'LAR, Thomas (1812-99). An American poet, born in New York City. He learned the trade of printing in the Harpers' publishing house, and then entered the firm of Lawrence Johnson & Co., Philadelphia, as a proofreader. He rose to be a partner, and the head of the establishment, later known as the firm of MacKellar, Smith & Jordan.. His works include: *Droppings from the Heart* (1844); *Tam's Fortnight Ramble* (1847); *Lives for the Gentle and Loving* (1853); and *Rhymes Atween Times* (1873). The last volume contains his popular poem, "Let Me Kiss Him For His Mother," which is founded on an episode of the Civil War.

McKEN'DREE, William (1757-1835). A Methodist Episcopal bishop. He was born in King William County, Va., July 6, 1757; served in the Revolutionary War; was converted and joined the Methodist Church in 1787; became presiding elder in 1796, and bishop, the first one born in America, in 1808. He died near Nashville, Tenn., March 5, 1835. By reason of his travels with Bishop Asbury and as superintendent of the societies in Virginia, Kentucky, Tennessee, Ohio, and Illinois, before he became bishop, and his travels after that, he was well known to Methodists, especially in those States. His *Life* by Paine (Nashville, 1869; new ed. 1875) is consequently an important source of early Methodist history.

McKENDREE COLLEGE. An institution of learning at Lebanon, Ill., under the auspices of the Methodist Episcopal Church, organized in 1828 as Lebanon Seminary, and one of the earliest institutions in the West dedicated to higher education. Its name was changed in 1830 in honor of Bishop McKendree, who devised his estate to the college. A new charter was secured in 1839 with the coöperation of Abraham Lincoln, granting the institution full university privileges. The college proper offers a classical and a scientific course; it has also graduate and law departments and a conservatory of music. It confers the bachelor's degree in arts, science, law, and music, and the master's and doctor's degrees for graduate work. Students are admitted on examination or on certificate from approved schools. In 1902 it had a faculty of 12 instructors. The student enrollment comprised 42 in the college, 105 academic, and 76 in music.

The library contained 10,000 volumes. The endowment was $42,000, and income $6111. The buildings and grounds were valued at about $50,000.

MACKEN'NA, BENJAMIN VICUÑA. A Chilean historian. See VICUÑA-MACKENNA, BENJAMIN.

McKENNA, JOSEPH (1843—). An American jurist, born in Philadelphia. His family went to California during his boyhood and settled there. He was educated at the Benicia Collegiate Institute, and in 1865 was admitted to the bar. In the same year, and again in 1867, he was elected district attorney of Solano County, and from 1875 to 1876 was a member of the State Legislature. In 1884 he was elected to Congress, where he served three terms and was on the Ways and Means Committee. He was appointed United States circuit judge for the Pacific Slope circuit in 1892, and in 1897 was made United States Attorney-General by President McKinley. In 1898 he took his seat as successor to Justice Field in the United States Supreme Court.

MACKEN'ZIE. A district of the Northwest Territories, Canada, created in 1895. It extends from Athabasca and British Columbia on the south to the Arctic waters on the north, and from Keewatin on the east to Yukon on the west, the western boundary line following the line of the Rocky Mountain Divide (Map: Northwest Territories, G 2). The southern boundary is in latitude 60° and the eastern in longitude 100°. It contains an area of 481,200 square miles, being the largest district of Canada, and almost as large as the Territory of Alaska. While the Territory has not been wholly explored, it is known to resemble the other Laurentian regions of Northern Canada, being hummocky and broken throughout, with numerous swamps and lakes. Great Bear Lake in the north and Great Slave Lake in the south are two of the largest lakes in the Dominion. The western half of the district is drained by the Mackenzie River (q.v.). Among other streams are the Coppermine and the Great Fish, or Back, rivers. The winters are long and severe, the summers short and warm.

The valley of the Mackenzie is covered almost to its mouth with forests of pine, spruce, tamarack, birch, and aspen poplar. The mountain slopes to the west are partially forested, the Douglas fir being common on the higher elevations. The northeastern half is almost wholly barren. Coal, salt, and other minerals are known to exist in the Great Slave Lake region and in the mountains to the west. Except in the most favored spots the climate is such that the cultivation of the soil will never be practicable. Fur-bearing animals abound in parts of the district, but aside from the revenue derived from this source the district has been of little commercial interest. Mackenzie is under the control of the Government of the Northwest Territories (q.v.). The few inhabitants are found mainly in the small settlements along the Mackenzie River.

MACKENZIE, Sir ALEXANDER (1755-1820). An explorer of the British Northwest. He was born in Inverness, Scotland, but at the age of twenty emigrated to Canada, where in 1787 he entered the service of the Northwest Company. In 1789 he set out from Fort Chippewyan on Lake Athabasca, and explored to its mouth the great river that now bears his name. Three years later he went on a second exploring expedition; this time he ascended the Peace River, crossed the Rocky Mountains, followed the Fraser for some distance, and then struck overland to the Pacific, which he reached near Cape Menzies. His *Voyages*, an account of these two expeditions, was published in London in 1802. In the same year he received the honor of knighthood.

MACKENZIE, ALEXANDER (1822-92). A Canadian statesman, born near Dunkeld, Perthshire, Scotland, January 28, 1822. At the age of fourteen he left school to take up the trade of a stonemason. In 1842 he emigrated to Canada, settling at Kingston, Ontario, where he became a contractor and builder. An ardent Whig by family traditions and education, he was selected in 1852 as editor of the newly founded *Lambton Shield* at Sarnia, and proceeded to instruct the Canadians in the principles of liberalism. Entering the Provincial Parliament for Lambton in 1861, he at once became conspicuous for his extensive knowledge and ready wit. On the union of the Canadas in 1867 he was elected by his former constituents to the Dominion Parliament and was soon recognized as the leader of the reform opposition. In 1873 he forced the resignation of the Conservative Ministry of Sir John Macdonald (q.v.), and became the first Liberal Premier of Canada. His Ministry, which pushed the construction of the Pacific Railway, and established a Supreme Court of the Dominion, is said to have been the purest that Canada has experienced. After its fall in 1878, Mackenzie led a brilliant opposition for two years, and then, owing to ill health, retired from the leadership of his party, though he remained in Parliament till his death, April 17, 1892. He twice visited Scotland (in 1875 and 1881), and was offered the honor of knighthood by the Queen. He published in 1882 the *Life and Speeches of George Brown*.

MACKENZIE, Sir ALEXANDER CAMPBELL (1847—). A Scottish composer, born at Edinburgh. On the advice of Bartel, a member of Gungl's band, who had settled in Edinburgh, he was sent to Sondershausen, Germany, in order to study music, when he was only ten years of age. He returned home in 1862 and obtained an engagement in a theatre orchestra. Acting on the advice of Sainton and Berthold Tours, he competed for the King's Scholarship at the Royal Academy of Music, and was successful. Upon the completion of his academy course, he returned to Edinburgh in 1865, and became favorably known as a solo violinist; on one occasion playing second violin in a quartet which included Joachim, Strauss, Norman-Nerudi, and Piatti. In 1873 he became conductor of the Scotch Vocal Musical Association, in which connection he introduced many German classics not hitherto known. About this time he devoted himself to composition, all his published works up to Opus 11 dating from this period. His health was poor, and on the advice of Von Bülow he moved to Florence, Italy. He returned to England, and in 1885 conducted the oratorio concerts which Messrs. Novello had inaugurated. He became principal of the Royal Academy of Music in 1888. He received the gold medal for art and science from the Grand Duke of Hesse in 1884, the order of Art and Science Saxe-Coburg and

Gotha in 1893. He subsequently became a corresponding member of the Florence Institute, and a member of the Royal Swedish Academy, as well as numerous other foreign societies; and in 1895 received the honor of knighthood from Queen Victoria. His most important compositions are: the choral works *The Bride* (1881), *Jason* (1882), *Columbia* (1883), *The Rose of Sharon* (1884), *The New Covenant* (1888), *The Cottar's Saturday Night* (1892), *His Majesty* (comic opera, 1897); orchestral scherzo (1878); Scotch rhapsodies, overtures, incidental music to *Ravenswood*, *Marmion*, and *The Little Minister*; concertos (violin), Opus 32, Pibroch. His music is in the classic mode and betrays his German training throughout; at the same time in a measure he succeeded in introducing the Scottish note in many of his national compositions.

MACKENZIE, Alexander Slidell (1803-48). An American naval officer, born in New York City. His family name was Slidell, his brother being the celebrated Senator John Slidell; but in 1837 he assumed the name Mackenzie in honor of a maternal uncle. Entering the United States Navy as midshipman in 1815, he became a lieutenant in 1825 and a commander in 1841. In 1842, while he was in command of the brig *Somers*, on its return from the West African coast, a conspiracy was thought to have been discovered among the naval apprentices who constituted the crew, and Mackenzie promptly arrested three men, who on December 1st were hanged from the yardarm in pursuance of the recommendation of a council of officers. One of these men, and apparently the ringleader, was John C. Spencer, the son of the Secretary of War. The affair created wide-spread excitement, Mackenzie being warmly commended in some quarters and bitterly attacked in others. A court of inquiry, and later a court-martial, completely exonerated him from all charges, though the attacks upon him continued and imbittered the whole of his subsequent life. In the Mexican War he was ordnance officer at the siege of Vera Cruz, and commanded the artillery division which stormed Tabasco (June 16, 1847). He was a facile and pleasing writer, and published a number of books, including: *A Year in Spain by a Young American* (1829); *Popular Essays on Naval Subjects* (1833); *The American in England* (1835); *Spain Revisited* (1836); *Life of John Paul Jones* (1841); *Life of Commodore O. H. Perry* (1841); and *Life of Commodore Stephen Decatur* (in Sparks's American Biography). Consult: *The Case of the Somers; Defense of A. S. Mackenzie* (New York, 1843); and, on the other side, James Fenimore Cooper, *The Cruise of the Somers* (New York, 1844).

MACKENZIE, Charles Frederick (1825-62). Church of England Bishop of Central Africa. He was born at Portmore, Peeblesshire, Scotland; graduated B.A. at Cambridge, 1848, where he was fellow and tutor. In 1855 he went to Natal with Bishop Colenso and worked among the English settlers till 1859. In 1860 he became head of the Universities' Mission to Central Africa and bishop. He worked among the savages in the Manganja country, and died at Malo, January 31, 1862. Consult his *Life* by Goodwin (2d ed., Cambridge, 1865).

MACKENZIE, Sir George (1636-91). A Scotch lawyer, author, and politician. The son of Simon Mackenzie, brother of the Earl of Seaforth, he was born at Dundee, studied Greek and philosophy at Saint Andrews and Aberdeen, and civil law at Bourges, in France. In 1661 he distinguished himself as counsel for the Marquis of Argyll, then tried by a commission of Parliament for high treason. About the same time he was made a justice-depute; shortly afterwards was knighted; entered the Scottish Parliament in 1669 as member for Ross-shire, and in 1677 was named King's advocate. Up to this point his career had been marked by a patriotic spirit, and he was one of the most popular men in the country. As criminal prosecutor in the memorable days of the Covenant, however, he earned for himself the name of the 'bluidy Mackenzie,' by his overbearing disposition, application of torture, and cruel sentences. He wrote a defense of his methods, entitled *A Vindication of the Government of Charles II.* In the midst of his professional labors he had assiduously devoted himself to literature, and in 1663 published *Religio Stoici, or a Short Discourse upon Several Divine and Moral Subjects;* in 1665 his *Moral Essay upon Solitude;* and in 1667 his *Moral Gallantry.* In 1678 appeared his *Discourse on the Laws and Customs of Scotland in Matters Criminal;* in 1684 his *Institutions of the Laws of Scotland;* and shortly after he took the leading part in founding the Advocates' Library. He retired to Oxford in 1690, and died in London the following year. Consult *Life* prefixed to his *Collected Works* (Edinburgh, 1716-22).

MACKENZIE, George Henry (1837-91). An American chess-player, born in Scotland. He entered the English Army and served several years in India. Coming to America, he served in the Federal Army during the Civil War, rising to be captain. He first became known as a chess-player in 1862, when he won the first prize in the handicap at the international chess contest in London, Anderssen being his opponent. In 1865 he came to New York, where he wrote on chess matters for the *Turf, Field, and Farm.* He won the first prizes at the annual contests of the New York Chess Club in 1865, 1866, 1867, and 1868. He played in the international chess contests at New York, 1876; Paris, 1878; Vienna, 1882; London, 1883; Frankfort, 1887, where he won the championship of the world; and Manchester, England, 1890.

MACKENZIE, Henry (1745-1831). A Scottish novelist, born in Edinburgh August, 1745; educated at the high school and University of Edinburgh. He practiced as an advocate there. In 1804 he was appointed comptroller of taxes for Scotland. He died January 14, 1831. His *Man of Feeling* (1771), *Man of the World* (1773), and *Julia de Roubigné* (1777) won for him a rather high place among the authors of his time. There is in all these novels something of the minuteness of Richardson, with a peculiar soft and sentimental tone, partly derived from Sterne. In 1779 Mackenzie began a periodical called the *Mirror* (modeled after the *Spectator*), which lasted for seventeen months. It was followed by the *Lounger* (1785-87). *The Man of Feeling*, one of the classics in sentimental literature, is published in Cassell's National Library.

MACKENZIE, James Cameron (1852—). An American educator, born in Aberdeen, Scotland. He came to America when he was a boy, studied in the public schools of Wilkesbarre, Pa., in the Bloomsburg Normal School of the same State, at Phillips Exeter Academy, and at Lafayette College, where he graduated in 1878. After studying theology at Princeton he was appointed head master of the Lawrenceville School and held this position till 1899, when, after a few months abroad, he was made director of Tome Institute, Port Deposit, Md. In the following year he founded the Mackenzie School at Dobbs Ferry, N. Y.

MACKENZIE, Sir MORELL (1837-92). An eminent English laryngologist. Born at Leytonstone, Essex, the son of a physician, he received his professional education at the London Hospital Medical College, where he took his degree in 1862, and at Paris and Budapest. At the latter city he met Czermak, who taught him the use of the laryngoscope, in the employment of which he soon became an expert, and which on his return he introduced in London. In 1860 he became connected with the London Hospital and held successively the posts of resident medical officer, registrar, assistant physician, and physician until 1874, when he resigned. He founded the London Throat Hospital in 1863. His operative skill soon made him the most prominent man in his specialty in England, and led to his appointment in 1887 to attend the Crown Prince of Germany, afterwards Emperor Frederick III., who was attacked with cancer of the throat. In spite of bitter controversies with the German physicians in attendance, Mackenzie remained with the Emperor until his death in 1888. For these services he was knighted by Queen Victoria and received the Grand Cross and Star of the Hohenzollern Order of Germany. He was the first president of the British Laryngological Society; president of the laryngological section of the international medical congress held at Copenhagen in 1884; was a corresponding member of the Royal Society of Vienna and of the Medical Society of Prague; and an honorary fellow of the American Laryngological Association. His more important works are: *The Use of the Laryngoscope* (London, 1866); *Essay on Growths in the Larynx* (London, 1871); *A Manual of Diseases of the Throat and Nose* (New York, 1880); *The Hygiene of the Vocal Organs* (London, 1886); and *The Fatal Illness of Frederick the Noble* (London, 1888).

MACKENZIE, RANALD SLIDELL (1840-89). An American soldier, born in Westchester County, N. Y., son of A. S. Mackenzie. He entered Williams College, but soon went to West Point, where he graduated with first honors in 1862. He received a commission in the engineer corps, was sent to the front, and was wounded in the second battle of Bull Run. During the following years he took part in all the campaigns of the Army of the Potomac, was four times brevetted for 'gallant and meritorious services,' and on July 10, 1864, when only twenty-four years of age, was appointed colonel of the Second Connecticut Heavy Artillery and given command of a brigade. During the closing years of the war he participated in the Shenandoah campaign and commanded a cavalry division under General Sheridan during the operations which culminated at Appomattox. After the conclusion of the war, Mackenzie was stationed on the western frontier, where he performed efficient service against the hostile Indian tribes. During one of his expeditions against the Kickapoos and Lipans, he pursued them into Mexico and punished them severely. The Mexican Government objected to this violation of its territory and made it the subject of considerable diplomatic correspondence, but the authorities at Washington upheld General Mackenzie. He was appointed a brigadier-general in the Regular Army in 1882, and retired from active service on March 24, 1884.

MACKENZIE, WILLIAM LYON (1795-1861). Leader of the rebellion of 1837-38 in Upper Canada. He was born at Dundee, Scotland, but in 1820 emigrated to Canada and settled first at York (Toronto) and later at Queenstown, where he opened a bookstore, and in 1824 began the publication of a newspaper entitled the *Colonial Advocate,* in which he fiercely assailed the Government. He soon afterwards removed to York, the capital of Upper Canada, where he made himself a political factor. In 1828 he was elected to the Legislature. In 1830 he was reëlected, but the Assembly refused to receive him on account of an alleged libel on the Ministry. He was then thrice reëlected and each time expelled. The Government then, to prevent a recurrence of the trouble, refused to issue writs for another election. In 1829 he visited the United States, and in 1832 he was sent to England as the delegate of his party to secure the redress of certain abuses and the removal of certain officials—a mission which he successfully accomplished. After his return he was, in 1834, chosen the first Mayor of the city of Toronto, formerly the town of York, and in the following October was again elected to the Assembly, where, his party being now in the majority, he was regularly seated. Two months later, December 9, 1834, he founded the Canadian Alliance Society, through the instrumentality of which he hoped to effect his reforms. Meantime he acted as chairman of a committee of grievances appointed by the Assembly, and this committee submitted a report complaining among various things of the extent of the patronage of the Crown and of the small share which the Legislature had in disposing of the revenues. One of the results of this report was the recall of the Governor, Sir John Colborne. Meanwhile a large element of the French inhabitants of Lower Canada were organizing in opposition to the British régime, and in 1835 Mackenzie was sent by his party to visit their leader, Louis J. Papineau (q.v.). In 1836 Mackenzie failed of reelection to the Assembly, and from this time events moved rapidly in the direction of rebellion. The *Colonial Advocate* had not appeared since 1834, but in 1837 Mackenzie started a new paper, the *Constitution,* in which he advocated violent measures, applauded the people of Lower Canada, who were on the brink of open insurrection, and on August 2d published the *Declaration of the Reformers of Toronto to Their Fellow Reformers in Lower Canada,* which has been called the declaration of independence of Upper Canada. On November 25, 1837, Mackenzie proclaimed the establishment of a provisional government. Soon afterwards between seven and eight hundred men gathered under his leadership for the purpose of marching on the capital and setting up an independent government, but delays gave the Governor, Sir Francis Bond Head, time to prepare for defense, so that when they finally did advance, they were met on the evening of December 5th by a small body of loyalists, who fired one volley, whereupon both sides retreated at full speed. Two days later the Governor marched out at the head of his forces and attacked the Reformers at Montgomery's Farm, and after a brief engagement utterly defeated them. Mackenzie escaped to the United States, where he found many sympathizers, and with their help set about organizing an expedition, establishing his headquarters on Navy Island in the Niagara River. Not long afterwards, while in Buffalo, he was arrested for violating the neutrality laws of the United States, was convicted, and was imprisoned at Rochester until pardoned on May 10, 1840. After his release he was employed in the New York Custom House, and later on the New York *Tribune*. On February 1, 1849, the Canadian Government granted a general amnesty to all who had taken part in the rebellion, and Mackenzie then returned to Toronto and was once more elected to the Legislature, in which he served from 1850 to 1858. Among his publications are: *Sketches of Canada and the United States* (1833); *Lives and Opinions of Benjamin Franklin Butler and Jesse Hoyt* (1845); and *Life and Times of Martin Van Buren* (1846). Consult: Lindsay, *Life and Times of William Lyon Mackenzie* (Toronto, 1862); Dent, *Story of the Upper Canadian Rebellion* (Toronto, 1885); and Read, *The Canadian Rebellion of 1837* (Toronto, 1896).

MACKENZIE RIVER. A river of the Dominion of Canada, one of the longest streams of North America, first explored in 1789 by Alexander Mackenzie, from whom it derives its name (Map: Canada, E 3). It has its origin under the name of Athabasca River near Mount Brown, in the Rocky Mountains, on the eastern borders of British Columbia, and after a north-northeast course of 687 miles falls into Lake Athabasca. Emerging from this lake as the Slave River, it receives the Peace River, and after another course of 210 miles empties into Great Slave Lake (q.v.). It thence assumes the name of Mackenzie River, and conveys the waters of Great Slave Lake to the Arctic Ocean at Mackenzie Bay. Estimated total length, 2500 miles; area of basin, 590,000 square miles. After leaving Great Slave Lake it receives the waters of Great Bear Lake. Its upper course lies through a fertile and well-timbered district, and there is an extensive deposit of lignite along its lower course and estuary. On its banks are Forts Simpson, Norman, and Good Hope. In many places it is more than a mile in width, and during the summer months is navigated by the steamboats of the Hudson's Bay Company throughout the greater part of its course from Great Slave Lake to the Arctic Ocean. There is only one obstruction and that not a serious one, occurring near Fort Good Hope, about latitude 66° N.

MACKEREL (OF. *makerel, maquerel, maquereau*, Fr. *maquereau*, from ML. *macarellus*, mackerel, probably from Lat. *macula*, spot). A fish of the spiny-rayed family Scombridæ, and especially of the typical genus Scomber. The body is spindle-shaped and compressed, with a slender caudal peduncle, keeled on each side, and a crescent-shaped tail. There are two dorsal fins, the posterior one succeeded by from five to nine finlets. The common mackerel (*Scomber scombrus*) is abundant on both sides of the North Atlantic, south to Spain, in Europe, and Cape Hatteras in America. It is a very beautiful fish, brilliant green and blue above with about thirty-five wavy black transverse streaks, and silvery below. The average length is about 12 inches, such a fish weighing about a pound. Occasionally one finds a specimen 20 inches in length with a weight of 3 to 4 pounds. Maturity is reached about the fourth year. Young mackerel are variously called 'spikes,' 'blinkers,' and 'tinkers,' according to their size. The mackerel appear along the coast in spring in immense schools, often estimated to contain hundreds of thousands of barrels, wandering widely and voraciously feeding upon anything smaller than themselves, mainly young fishes; and withdraw again in the fall to deeper, warmer waters. They spawn in May, June, and July on the American coast. The eggs are very minute and at first float at the surface, but subsequently gradually sink to the bottom. A single female may contain as many as 200,000 eggs; and during the summer of 1896 24,000,000 mackerel eggs were artificially hatched by the United States Fish Commission.

There are only a few species of mackerel, but these are widely distributed and everywhere highly valued as food. The flesh, especially of the common species, is excellent when eaten fresh, and is salted in very great quantities. The mackerel fisheries (see FISHERIES) are among the most important in both Europe and America. The principal fishing station in the United States is Gloucester, Mass. About 1000 vessels were employed in former years, but now the number has been reduced to less than 500. The chub mackerel (*Scomber colias*) is found in both the Pacific and Atlantic oceans. The immense horse mackerel (*Thunnus thynnus*), pelagic and found in both oceans, reaches a length of 10 feet and a weight of 1500 pounds. The flesh is excellent and large numbers of the fish are caught by Europeans. (See TUNNY.) The Spanish mackerel (*Scomberomorus maculatus*) occurs on both coasts of the United States, attaining a weight of 8 or 9 pounds, and is a most excellent food fish. Consult: Goode, *Fishery Industries*, sec. i. (Washington, 1884), and other works cited under FISH and under FISHERIES. See Plate of MACKERELS.

MACKEREL GUIDE. A British name for a gar (q.v.).

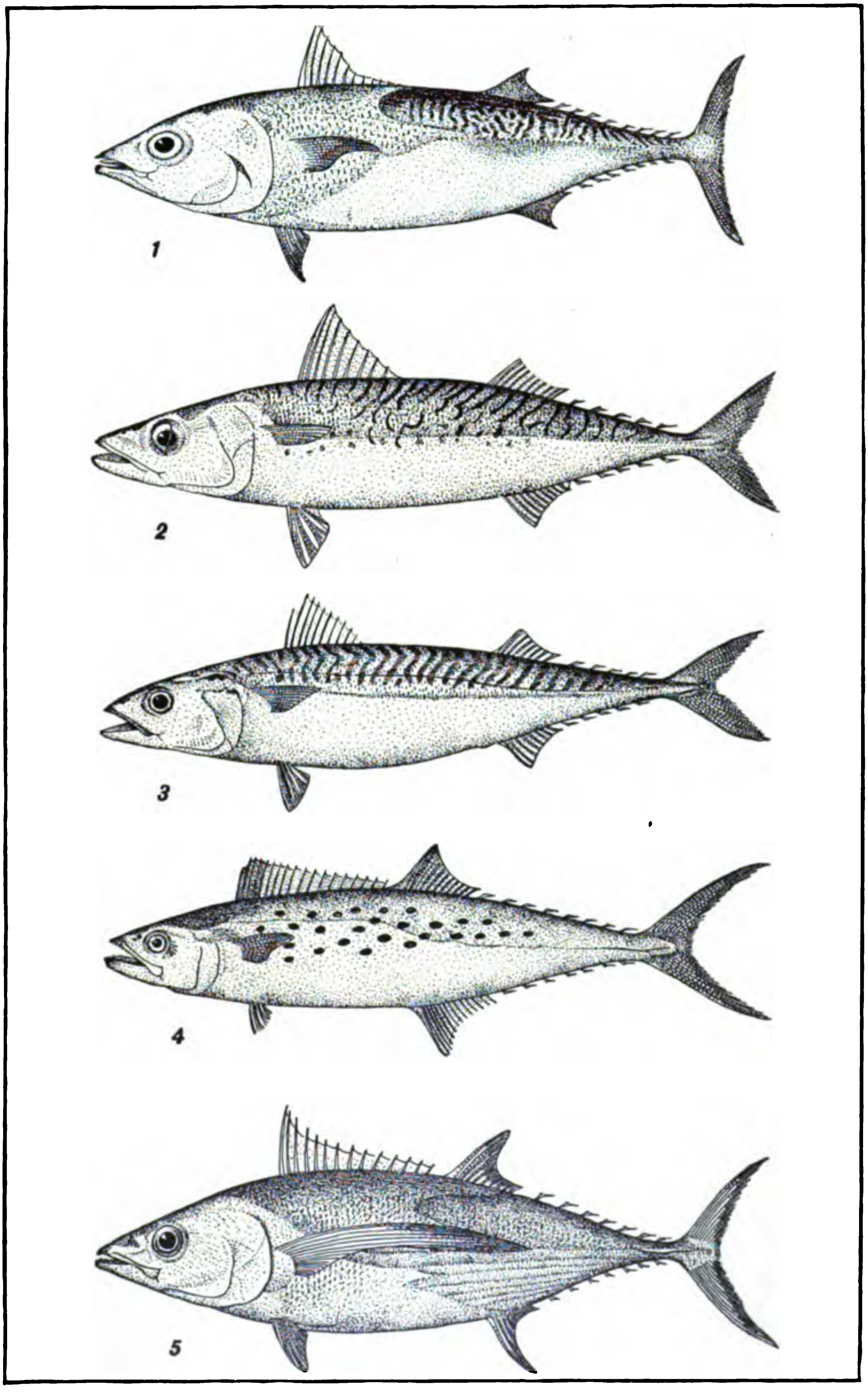
MACKEREL GULL (so called because of feeding on mackerel). Any of several of the smaller gulls, as the laughing gull. In New Zealand, a small and numerous species locally called 'tarpunga,' which plunders oyster-catchers and other shore-birds of food.

MACKEREL MIDGE. A British name for any local species of codling.

MACKEREL SHARK. See PORBEAGLE.

MACK'EY, ALBERT GALLATIN (1807-81). An American writer on Freemasonry. He was born at Charleston, S. C., and was educated there for the practice of medicine, which he later relinquished for literature and especially that pertaining to Freemasonry. In 1850 he established in Charleston a Masonic monthly magazine and in 1858 a quarterly in the same interest. His chief works include: *Cryptic Masonry and Masonic Ritualist* (1867); *Symbolism of Freemasonry* (1869); *A Text-Book of Masonic Jurisprudence*

MACKERELS



1. TUNNY (Thunnus thynnus).
2. CHUB MACKEREL (Scomber colias).
3. COMMON MACKEREL (Scomber scombrus).
4. SPANISH MACKEREL (Scomberomorus maculatus).
5. ALBACORE (Germo alalonga).

(1869); and *Encyclopædia of Freemasonry* (1874).

McKIB'BIN, CHAMBERS (1841—). An American soldier, born in Chambersburg, Pa. He enlisted as a private in the Regular Army during the Civil War, and in 1867 was promoted to be captain, and in 1892 to be major. In 1898, as lieutenant-colonel of the Twenty-fifth Infantry, he participated in the invasion of Cuba, and received in official reports special mention for distinguished service. He was subsequently made brigadier-general of volunteers, and was appointed military Governor of Santiago de Cuba, in which office he was succeeded by Gen. Leonard Wood.

MACK'IE, JOHN MILTON (1813-94). An American author, born in Wareham, Mass. He graduated at Brown University in 1832, and was tutor there in 1835-38. He contributed to reviews, and published *Life of Godfrey William von Leibnitz* (1845); *Life of Schamyl, the Circassian Chief* (1856); and *From Cape Cod to Dixie* (1864). He was, besides, a frequent contributor to the *North American Review.*

McKIM', CHARLES FOLLEN (1847—). An American architect, son of J. M. McKim. He was born in Chester County, Pa., August 24, 1847, and was educated in Harvard University and in the Ecole des Beaux-Arts, Paris. In conjunction with his partners, W. R. Mead and Stanford White, he has, since 1880, contributed greatly to the improvement of architecture in the United States. He made designs for the Boston Public Library; the Library, and other buildings of Columbia University, the Century, Metropolitan, and University clubs, and the Bowery Savings Bank, all in New York; the Agricultural Building at the Columbian Exhibition in Chicago (1893); and the vast and splendid scheme for the improvement of Washington, D. C. (in conjunction with D. H. Burnham and F. L. Olmsted, Jr.). In other works, like the Madison Square Garden, Washington Arch, and the Library and Hall of Fame of New York University, all in New York, Mr. McKim's hand is less predominant, but still evident. His success has been in large measure due to an admirable skill in producing large monumental effects, chiefly with adaptations of classic and Renaissance motives, and to a refined taste combined with a highly developed decorative sense.

McKIM, JAMES MILLER (1810-74). An American abolitionist, born in Carlisle, Pa. He studied at Dickinson and Princeton, and then entered the ministry of the Presbyterian Church, but soon after the organization of the American anti-slavery movement, left the pulpit to devote himself to the cause of emancipation, which he served with marked ability until near the close of the Civil War, as lecturer, organizer, corresponding secretary of the Pennsylvania Anti-Slavery Society, and editor at times of the *Pennsylvania Freeman.* When the emancipation of the slaves was proclaimed by President Lincoln, he resigned his office in the anti-slavery society to devote himself to the work of the Freedmen's Aid Commission, where his earnest devotion and wide experience were of the greatest value.

MACKINAC (măk'ĭ-nạ) **ISLAND**. A city in Mackinac County, Mich., on an island of the same name, situated in the Straits of Mackinac connecting lakes Huron and Michigan, 260 miles north by west of Detroit (Map: Michigan, J 3). The island, three miles in length by two in width, is rocky and densely wooded, and is a popular place of resort, noted for its healthful climate and picturesqueness. Fort Mackinac, on an elevation back of the city, which is situated on the southern shore, commands the strait. The village of Mackinac Island received a city charter in 1900. Population, in 1890, 750; in 1900, 665.

MACKINAW TROUT. See NAMAYCUSH.

McKIN'LEY, WILLIAM (1843-1901). The twenty-fifth President of the United States, born at Niles, Ohio, January 29, 1843, of Scotch-Irish ancestry. His great-grandfather, David McKinley, a soldier of the Revolution, was a resident of York County, Pa., and removed thence to Ohio, where, in 1829, his grandson William married Nancy Allison. From this marriage came nine children, the seventh of whom, the subject of this sketch, was early engaged, as had been his father and grandfather before him, in the iron industry. He secured, however, a partial education at the Poland Academy, and later entered Allegheny College, at Meadville, Pa., although he soon withdrew and engaged in teaching school. He was thus occupied at the outbreak of the Civil War, and early enlisted, being mustered into the Twenty-third Ohio Volunteers on June 11, 1861. The colonel of the regiment was William S. Rosecrans, and its lieutenant-colonel Stanley Matthews, while Rutherford B. Hayes later served as colonel, the regiment becoming especially conspicuous and being engaged in some nineteen battles during the war, first serving under General McClellan in western Virginia. At the close of his first winter's service McKinley was made commissary-sergeant and was soon attached to the staff of Colonel Hayes. After the spring of 1862 the regiment was transferred to Washington, and later took an active share in the battles of South Mountain and Antietam. McKinley especially distinguished himself at Antietam, when, at great personal risk, he carried a supply of food from the rear to the soldiers at the front. For this gallantry he was recommended for promotion by Colonel Hayes, and under date of September 23, 1862, was made second lieutenant, and on February 7, 1863, was commissioned first lieutenant. McKinley continued with his regiment throughout the war, serving as an aide both to General Hancock and to General Crook, repeatedly rendering effective services, and gaining particular prominence by his work at Opequan Creek, Fisher's Hill, and Cedar Creek, for which he was brevetted major on March 13, 1865. He had already, on July 25, 1864, been commissioned captain, but the brevet title was that by which he was commonly known in later life.

Major McKinley was mustered out of the volunteer service on July 25, 1865, and immediately took up the study of law in the office of Judge Glidden, completing his preparation by a course at the Albany Law School. Being admitted to the bar in 1867, he established himself at Canton, Ohio, his home for the remainder of his life, and although Stark County was Democratic, he, a Republican, was elected its prosecuting attorney in 1869. In 1875, when the Republican candidate for Governor was Colonel Hayes, McKinley took an active part in the campaign. He was himself elected to Congress in the year following, and served in the Lower House for seven consecutive terms. In his first term, in connection with the Wood Tariff Bill, he upheld the protectionist policy, although his early views on the subject have been considered as less positive than those which he expressed in his later years. Not only upon that subject did the development of his views seem to some to show inconsistencies, but also with reference to financial questions was there an even more marked change, inasmuch as he stood with the Western wing of his party in favor of the remonetization of silver, and voted for the Bland-Allison Bill, even against the veto of President Hayes. When Garfield was transferred to the Senate, McKinley succeeded him as a member of the Ways and Means Committee of the House. In the same term he spoke vigorously against the repeal of the Federal Election Law, and his speech on the subject was used as a campaign document in 1880. In that campaign he served as a member of the Republican National Committee, was chairman of the Ohio State Convention, and was himself reëlected to Congress. In the next national campaign also he took an active part, drafting the tariff plank in the Republican platform. In the succeeding administration he became a leader in opposition to the Mills Bill and to President Cleveland's plan of tariff reform. Again in the campaign of 1888 he prepared the tariff plank of the Republican platform, being chairman of the Committee on Resolutions. He was one of the managers of the campaign of John Sherman, although at one time it seemed that the convention would be turned to himself. He prevented that contingency, however, by a vigorous speech. By this time he was recognized as a distinctively national leader, and although Thomas B. Reed secured the Speakership of the House, McKinley was made chairman of the Committee on Ways and Means, and in that position framed and carried through Congress the highly protectionist tariff which bears his name. (See TARIFF.) In the election of 1890 he was defeated. Ending his Congressional service in 1891, he was in the same year elected Governor of Ohio by a plurality of more than 21,000 over Campbell, who in 1890 had carried the State by 11,000, and the success was emphasized in 1893, when McKinley was reëlected by about 81,000 plurality. The four years of his service as Governor were marked by the establishment of a State Board of Arbitration, by improvement in the organization of the National Guard, and by other evidences of effective administration. His first term, however, was disturbed by serious embarrassment in his personal finances, from which he was relieved by the assistance of a number of friends, chiefly friends whose political relations with the Governor seemed at times to make the relief more prolific of criticism than insolvency would have been. His second term was marked by the activity of the corporate interests, particularly of the promoters and backers of street railways, and the Governor's connection with legislation on these matters was such as to provoke much hostile comment. His policy with reference to the charitable institutions of the State also was such as to give his opponents opportunity for severe criticism, although in general his administrations were such as to enhance his reputation outside of his State and to mark him still more plainly as a national leader. He was thus the natural and the leading candidate before the Saint Louis Convention in 1896, where on the first ballot he received 661½ votes. Coming out now strongly for the gold standard, in accordance with his party's platform, he quieted the fears aroused by his earlier course and even by his support of the Sherman Bill so late as 1890, and took a vigorous lead in the work against the free-silver campaign of Bryan. His personal campaign was unusual in that he remained at Canton throughout, making, however, some 300 speeches from his own porch and there addressing in the aggregate probably a million persons. Although he received in the popular vote a plurality of only about 600,000 votes in a total of more than 14,000,000 votes, he nevertheless received 271 electoral votes as against 176 cast for Bryan. Garret A. Hobart was elected Vice-President. McKinley's first administration was characterized particularly by the events and policies incident to the acquisition of extensive colonial possessions. The war with Spain, precipitated by the conditions in Cuba, resulted through the treaty of December 10, 1898, in the annexation of Porto Rico, of the Philippine Islands, and of Guam, upon the payment to Spain of $20,000,000, and resulted also in the termination of Spanish sovereignty in Cuba. For the remainder of McKinley's service as President, the efforts of the Administration were directed to the organization and maintenance of proper local administration throughout Cuba, to the general improvement of the material and social condition of the people, and to the preparation of the inhabitants for the conduct of a general republican form of government, which was to be instituted under the direction of the President's successor. Equally without precedent in our history were the exigencies presented in the problem of administering colonial dependencies, a problem which in the early years was made still more difficult by the protracted warfare carried on by portions of the Philippine population. Through the efficiency of the administrators selected by the President, and especially through the effective work of the commission headed by Judge William H. Taft, the close of McKinley's first administration saw the greater portion of the newly acquired islands in a condition of peace and with an orderly administration of government, in which the natives shared, and with most of the attendant circumstances such as to justify the claim that the assumption of the duties of colonial administration had been successfully effected. By this development, however, many new problems, both of politics and of jurisprudence, were presented, and in such a manner as to make impressive the fact that under McKinley the nation had entered upon what in various respects seemed to be a new course of development. Furthermore, during his administration, in August, 1898, Hawaii finally became a part of the United States, and two years later received a Territorial Government, with the right to a delegate in Congress. At the close of 1899 negotiations were concluded by which the tripartite control of Samoa (q.v.) was terminated, and the United States secured control of Tutuila with the harbor of Pago-Pago. A number of reciprocity treaties were concluded, so that from many points of view the Administration seemed engaged in an expansion of influence and of territory through the methods of peace as well as through those of war. As the representative of these lines of policy, and as the one through whom especially these policies had been carried to a successful issue, McKinley gained a position of unusual prestige and was looked upon as embodying the successes which under his lead the people had achieved. In 1900 he was again nominated, and received 292 electoral votes, while Bryan, again his competitor, received only 155. Theodore Roosevelt was elected Vice-President. The mass of people came to regard McKinley with an esteem and a confidence rarely shown for so long a period to any public leader. He had in a high degree the ability to foresee the trend of public thought and so to shape his course as to render certain the public approval. Being able to ignore petty controversies, having a fine sense of relative proprieties, and being a man of devotion to high principles, he was regarded as preëminently a good man, while the events of his administration made it natural that he should be regarded by many as one of the few great Presidents. His untiring devotion to his invalid wife, Ida Saxton, whom he had married in 1871, and who survived him, aroused the admiration of the whole nation. In the full swing of triumph following his second inauguration and incident to a general recognition of the success of his work in the new possessions, the President was stricken by an assassin, Czolgosz (q.v.), while holding a public reception at the Pan-American Exposition at Buffalo, on September 6, 1901. On the day preceding the President had delivered an address on reciprocity, and just as he was proposing a policy which might have made his second administration fully as momentous as had been his first, his service was ended in an instant. The surgeons who were summoned operated almost immediately upon the wounded man, and thus made possible the fight for life which was then carried on, and at times with every prospect of success, until finally, on September 14th, the President passed away. With hope already restored, the actual end came so suddenly as to make a most profound impression both in this country and abroad, and the day of the burial was observed throughout the nation with unusual indications of grief and of deep sorrow. The interment was at Canton, where an appropriate monument is to be erected through general subscriptions. No adequate biography has been published. For a review of the public affairs during McKinley's Presidency, see the article on UNITED STATES.

McKINLEY, MOUNT (called by the Russians *Bolshaya*, and by the Shushitna Indians *Traleyka*). The highest peak of North America. It is situated in South Central Alaska between the sources of the Kuskokwim and the Shushitna rivers, 150 miles north of the head of Cook Inlet (Map: Alaska, E 3). It is covered with snow and surrounded by glaciers, and towers from the rough and saw-toothed ridge of the Alaska Mountains to the height of 20,464 feet above the sea.

McKIN'NEY. A city and the county-seat of Collin County, Texas, 31 miles north by east of Dallas; on the Houston and Texas Central and the Missouri, Kansas and Texas railroads (Map: Texas, F 3). It has the McKinney Collegiate Institute, and a courthouse that cost $100,000. McKinney is surrounded by a productive farming section, and enjoys a considerable trade; its industrial establishments include cotton gins and compresses, cottonseed oil mills, flour mills, carriage shops, etc. The city owns and operates the water-works. Population, in 1890, 2489; in 1900, 4342.

MACKINTOSH. An overgarment which has been made water-proof by the application of a solution of India-rubber. The name is derived from the inventor. See RUBBER.

MAC'KINTOSH, Sir JAMES (1765-1832). An English philosopher, born at Aldourie, Inverness-shire. He studied at King's College, Aberdeen, where his most intimate companion was Robert Hall (q.v.), afterwards the celebrated Baptist preacher. From King's College he proceeded to Edinburgh in 1784 to study medicine; and having in 1787 obtained his diploma, settled in London, where for some time he supported himself by writing for the newspapers. The first work that brought him into notice was his *Vindiciæ Gallicæ* (1791), in reply to Burke's *Reflections on the French Revolution.* In many respects it was considered greatly to have surpassed the philippic against which it was directed, and was not only lauded by the Liberals, but was highly esteemed by Burke himself. Fox, Sheridan, and other leading Whigs sought the author's acquaintance; and when the association of the 'Friends of the People' was formed, he was appointed secretary. About this time he began to turn his attention to the legal profession, and having in 1795 been called to the bar, soon attained high eminence as a forensic lawyer. In 1799 he delivered before the benchers of Lincoln's Inn a course of lectures on the law of nature and of nations which were attended by large audiences. His defense of Peltier (February 21, 1803), charged with libel against Bonaparte, was translated into French by Mme. de Staël, and scattered broadcast over Europe. In 1806 Mackintosh was appointed a judge of the Vice-Admiralty Court at Bombay, where he remained until 1811. After his return to England he entered Parliament as Whig member for Nairn (1813), accepted the professorship of law in the College of Haileybury in 1818, and in 1830 became a member of the board of control under the Grey Ministry, when, as his last great political effort, he spoke in favor of the Reform Bill.

MACK'LIN, CHARLES (1697?-1797). An actor and playwright, born in Ireland in 1697 or a little earlier. His real surname was McLaughlin. After a reckless and wandering youth, he appeared in small parts at Lincoln's Inn Theatre, London (c.1730). Three years later he played important comic rôles at Drury Lane Theatre. In 1735 he quarreled with a brother actor, Hallam, whom he accidentally killed. He was tried for manslaughter, and convicted; but he seems to have escaped imprisonment. After many quarrels with Garrick he left Drury Lane (1744) and began to give lessons in acting, an occupation which he kept up almost to the end of his life. In 1744 he opened the Haymarket with a company which he had trained. Macklin soon after this became the mainstay of Drury Lane. In 1753 he quitted the stage to open a tavern under the Piazza of Covent Garden. A bankrupt by 1758, he again returned to the stage, acting at various theatres till May, 1789, being then fully ninety years old. He died July 11, 1797, after a life filled with quarrels and lawsuits. His Shylock, which he played for fifty years, was a famous creation. He also excelled in his numerous comic rôles. Of his own plays, only three were printed: *The True-born Irishman, Love à la Mode,* and *The Man of the World.* The last is a masterpiece. Macklin's *Life* was written by Congreve (London, 1798), turned into sheer romance by Kirkman (ib., 1799), untrustworthily described by Cooke (ib., 1804), and well treated by Parry (ib., 1891).

MACKONOCHIE, mȧ-kŏn'ō-kĭ, Alexander Heriot (1825-87). An English ecclesiastic, famed for his High Church views. He was born at Fareham, and was educated at Bath, Exeter, Edinburgh, and Wadham College, Oxford. In 1858 he began to work with Charles Fuge Lowder (q.v.) at Saint George's in the East, London, and four years after took charge of Saint Alban's, Holborn, in a London slum where he worked for twenty years. Here he officiated at services so elaborate as to be called by Shaftesbury, in 1866, "in outward form . . . the worship of Jupiter or Juno." For his Catholic ritual he was prosecuted again and again—in 1868, 1869, and 1870, in 1874, and in 1882. In the last year he resigned out of respect for the wish of the dying Archbishop Tait, and accepted a charge at Saint Peter's, London Docks; but was forced to resign from it (1883), and returned to Saint Alban's and worked there unofficially. He was found dead in the snow, in the deer forest of Manore, where he had lost his way, in December, 1887. He did a great work in the London slums and his continual suits at law helped to clear up difficulties on ritual questions. Consult the *Life* by Mrs. Fowle (1890).

McLACHLAN, măk-lăᴋ'*lan*, Alexander (1818-96). A Scottish-Canadian poet. He was born in Johnstone, Renfrewshire, Scotland, and went to Canada in 1840. He was a man of democratic disposition, as is shown by the vigorous radicalism of his verse—*The Spirit of Love, and Other Poems* (1846); *Poems, Chiefly in the Scottish Dialect* (1856); *Lyrics* (1858); *The Emigrant, and Other Poems* (1861); *Poems and Songs* (1874). In 1863 he was Government emigration agent in Scotland, where he lectured, as well as in Canada and the United States. A complete edition of his poems, with a memoir, was published in 1890.

MACLA'GAN, William Dalrymple (1826—). An English prelate. He was born in Edinburgh, and educated there and at Peterhouse College, Cambridge. He served in the Indian Army from 1847 to 1852; was ordained priest in 1857; was rector of Newington, then vicar of Saint Mary Abbott's, Kensington, till 1878, when he was appointed Bishop of Lichfield. In 1891, on the death of Dr. Magee, he was translated to the Archbishopric of York, and in the same year was made an honorary fellow of Peterhouse College, Cambridge. In 1899 and 1900 he sat as assessor with the Archbishop of Canterbury in a voluntary spiritual court for the hearing of cases involving important principles of ritual and the determination of the law and practice of the Church upon them. Opinions were given at these sittings, having only moral force, on the ceremonial use of incense and of processional lights, and the reservation of the Sacrament, the preparation of which involved careful historical and legal research. He also joined his brother primate in a learned and effective defense of Anglican orders at the time when they were declared invalid at Rome. He edited, in connection with Dr. Archibald Weir, the *Church and the Age: Essays on the Principles and Present Position of the Anglican Church* (2 vols., 1870), and published a volume of pastoral letters and synodical charges (1891).

McLANE, măk-lān', Allan (1746-1829). An American soldier in the Revolutionary War. He entered the Continental Army as a volunteer in 1775; became a lieutenant under Cæsar Rodney in the same year; distinguished himself at Long Island and White Plains; participated in the New Jersey campaign, and was promoted to a captaincy in 1777. He commanded the American outposts about Philadelphia in 1777-78, and took part in the battle of Monmouth. The next year he was a major in Gen. Henry Lee's 'legion,' and assisted materially in the capture of both Stony Point and Paulus Hook. He remained in the army until the close of the war, and subsequently became a judge of the Delaware Court of Appeals, United States marshal for Delaware, and collector of the port of Wilmington. He was a man of gigantic stature and wonderful physical strength, and was noted for his great personal bravery.

McLANE, Louis (1786-1857). An American statesman, born in Symrna, Del. He began his career as a midshipman in the navy, but later studied law and entered politics. He was a Representative in Congress from 1817 to 1827, and a Senator from 1827 to 1829, when he was appointed Minister to England, where he carried on negotiations which resulted in the opening of the British West India ports to our trade. He returned from England in 1831 in order to become Secretary of the Treasury in Jackson's Cabinet, but in 1833 disapproved of Jackson's order to withdraw the deposits from the United States Bank, and was transferred to the State Department, where he remained one year. From 1837 to 1847 he was president of the Baltimore and Ohio Railroad. In 1845 he was again made Minister to England, but resigned in 1846 after the settlement of the Oregon question.

McLANE, Robert Milligan (1815-98). An American diplomatist, born in Delaware. He studied at Saint Mary's College, Baltimore, and in France, and graduated at West Point in 1837. He resigned from the army in 1843 and practiced law in Baltimore. In 1845-46 he was in the Legislature of Maryland, and from 1847 to 1851 served in the United States House of Representatives. He was a Democratic Presidential elector in 1853, and in the same year was appointed Commissioner to China, but retired in 1854. In 1859-60 he was Minister to Mexico. He was a States' Rights candidate for Congress in 1861, but withdrew before the special election, and was a member of the committee appointed to consider the relations of Maryland with the Union. From 1879 to 1883 he was again a member of the United States House of Representatives. He was Governor of Maryland in 1884-85, but resigned to accept the post of Minister to France. After his retirement in 1889 he lived in Paris until his death.

MACLAREN, m'-klâr'*en*, Ian. The pseudonym of the Scotch writer John Watson (q.v.).

McLAREN, William Edward (1831-1905). An American bishop of the Protestant Episcopal Church. He was born in Geneva, N. Y., graduated at Jefferson College in 1851, was a tutor for a time, and in 1857-60 engaged in journalism in Pittsburg and Cleveland. He studied theology in the Presbyterian seminary at Pittsburg, and was ordained in the Presbyterian ministry and sent to Bogotá, South America, by the Board of Foreign Missions. He was afterwards pastor of churches in Pittsburg, in Peoria, Ill., and in Detroit. His views changed, and he was ordained priest in the Protestant Episcopal Church in 1872, and became rector of Trinity Church, Cleveland, Ohio. In 1875 he was consecrated Bishop of Illinois, and when the diocese was divided he retained the northern portion, now known as the Diocese of Chicago. He founded the Western Theological Seminary at Chicago in 1883, and Waterman Hall for girls at Sycamore, Ill. His publications include: *Catholic Dogma the Antidote of Doubt* (1884); *Inner Proofs of God* (1884); *Analysis of Pantheism* (1885); *The Practice of the Interior Life* (1897); *The Holy Spirit* (1899); and *The Essence of Prayer* (1901).

McLAUGHLIN, măk-la̤k′lĭn, Andrew Cunningham (1861—). An American historian. He was born at Beardstown, Ill., and graduated at the University of Michigan in 1882. After a course in the law department of the same institution, he became instructor and in 1891 professor of American history there. In 1903 he was appointed to organize the department of history in the Carnegie Institution. He wrote *Lewis Cass* (1891) and a *History of the American Nation* (1899), and edited Cooley's *Principles of Constitutional Law* (1898).

MACLAURIN, măk-la̤′rĭn, Colin (1698-1746). A Scotch mathematician, born at Kilmodan, in Argyllshire. While quite young he was left an orphan and was brought up by one of his uncles. He studied at the University of Glasgow, and there his mathematical genius showed itself very early. When only nineteen years old (1717) he obtained the professorship of mathematics in Marischal College, Aberdeen. In 1719 he visited London and made the acquaintance of Sir Isaac Newton, and was made a member of the Royal Society. In 1722 he was engaged by Lord Polwarth to travel with his son and spent some time in France, and while there obtained the prize of the French Academy for a treatise on the percussion of bodies. In 1726 he succeeded James Gregory as professor of mathematics in the University of Edinburgh. There he also devoted his attention to physics, astronomy, and other sciences, and soon acquired a wide reputation and influence. In 1740 he divided with Bernoulli and Euler a prize given by the French Academy for a work on the tides. In 1745 he organized the defenses of Edinburgh against the Pretender, his efforts at this time seriously impairing his health. When the rebels obtained possession of Edinburgh, he took refuge in England. He died in the following year. Next to Newton he was the greatest British mathematician of the eighteenth century. He developed the fluxional calculus, contributed extensively to the theory of attraction, and showed that a revolving homogeneous fluid assumes the form of an ellipsoid. This discovery is important for the light it throws on the theory of the tides and on the investigations in regard to the figure of the earth. He also contributed to pure geometry and the theory of equations. He invented the method of solving equations with equal roots by aid of the first derived equation. He is best known for an important theorem in calculus which bears his name. By means of this, a function of one variable may be expanded in terms of ascending integral powers of the variable. His most important works are: *Geometria Organica* (1719); *A Treatise of Fluxions* (1742; 2d ed. 1801; French trans. 1749); *Treatise of Algebra* (1748; 5th ed. 1788; French trans. 1753); *De Linearum Geometricarum Proprietatibus* (1748); *An Account of Sir Isaac Newton's Philosophy* (1748; 3d ed. 1775). Consult Murdoch in the preface to the last named work.

McLAWS, măk-la̤z′, Lafayette (1821-97). An American soldier, born in Augusta, Ga. He graduated in 1842 at the United States Military Academy, and served in the Mexican War. In 1861 he entered the Confederate Army, subsequently was promoted to be major-general, and commanded a division at Malvern Hill and many other battles. He surrendered with Johnston's army. In 1875 he was appointed collector of internal revenue at Savannah, and in 1876 postmaster of the same city.

MACLAY′, William (1737-1804). An American patriot and politician. He was born at New Garden, Chester County, Pa., of Scotch-Irish parentage, and was educated at an academy there. In the French and Indian War he served as a lieutenant in the expedition of Gen. John Forbes against Fort Duquesne in 1758, and later served under General Bouquet. He afterwards studied law and was admitted to the bar, after which he went to England to consult with the proprietors of Pennsylvania regarding land-grants to militia officers who had served in the French War. After returning to America he became attorney for the Penn family in Pennsylvania. He nevertheless actively interested himself in the Revolutionary movement, took a leading part in raising and equipping Pennsylvania troops, acted as assistant commissary of purchase, and saw some active service in the field. He was elected to the Pennsylvania Assembly in 1781, served on the State Executive Council, and as a judge of the Common Pleas, and in January, 1789, was elected with Robert Morris (q.v.) one of the first representatives of Pennsylvania in the United States Senate. He served only until 1791, but during that period attracted attention by his violent hostility to Washington, to whose presence in the Senate chamber he objected, and to the Federalist administration and policy generally. He served in the Pennsylvania Legislature in 1795 and was a county judge from 1801 to 1803. His *Journal* (edited by Edgar Stanton Maclay and published in 1890) contains a valuable and interesting account of the first national Congress.

MACLE, măk″l (OF. *macle*, *mascle*, Fr. *macle*, It. *macula*, from Lat. *macula*, spot, stain). A variety of andalusite, the crystals of which have the axis and angles of a different color than the remainder of the mineral, exhibiting in transverse section a tessellated appearance or a cross, which is due to a regular arrangement of the carbonaceous impurities through the interior. This mineral is also called 'cross stone,' and has been used for making beads for rosaries. The term *macle* is also sometimes used in mineralogy to designate twin crystals. See MINERALOGY.

MacLEAN, măk-lān′, GEORGE EDWIN (1850—). An American educator, born at Rockville, Conn. He graduated in 1871 at Williams College, studied theology, and held pastorates at New Lebanon, N. Y., and Troy, N. Y. After study at the universities of Leipzig and Berlin he was appointed professor of English language and literature in the University of Minnesota. In 1895 he became chancellor of the University of Nebraska, and in 1899 president of the University of Iowa. He published: *An Old and Middle English Reader* (1886); *An Introductory Course in Old English* (1891); and *An Old and Middle English Reader* (1893).

McLEAN, JOHN (1785-1861). An American political leader and jurist, born in Morris County, N. J. His father removed in 1785 to Virginia, then to Kentucky, and finally settled in Warren County, Ohio. Young McLean began the study of law in Cincinnati in 1803, and was admitted to the bar in 1807. In 1812 he was elected to the National Congress as a Democrat, and was unanimously reëlected in 1814. He declined the nomination to the United States Senate in 1815, but served from 1816 to 1822 as Justice of the Ohio Supreme Court. President Monroe appointed him Commissioner of the Land Office in 1822 and Postmaster-General the next year. He was continued in office by President John Quincy Adams, and worked such great improvement that Congress increased the salary of the office. He disagreed with President Jackson on the question of patronage and resigned from the Cabinet, though offered both War and Navy departments. President Jackson, however, appointed him to the Supreme Court of the United States in 1829. He wrote a dissenting opinion in the Dred Scott case, declaring that slavery exists by force and "is limited to the range of the laws under which it is sanctioned." In 1848 he was a candidate for the Presidential nomination of the Free Soil Party, and in 1856 received 196 votes at the Republican convention. He published *Reports of the United States Circuit Courts* (1829, 1840-56) and *Eulogy on James Monroe* (1831).

McLEAN, JOHN (1800-86). An American educator, tenth president of Princeton College. He was born in Princeton, where his father was professor of chemistry in the college, and lived there during his whole life. He graduated in 1816 and two years later became a tutor. From that time until his resignation of the presidency, which he held from 1854 till 1868, he was a member of the faculty. Among Dr. McLean's publications are *A Lecture on a Common School System for New Jersey* (1829), which had considerable influence with the Legislature when it later established a common school system; two letters on *The True Relations of the Church and the State to Schools and Colleges* (1853); and a *History of the College of New Jersey* (1877).

McLEAN, SARAH PRATT (1858—). An American author, born in Connecticut. She married Franklin Lynde Greene in 1887. Her first book, *Cape Cod Folks*, describing, it was said, persons she had known, involved her in a libel suit. Her other works include: *Some Other Folks* (1883); *Towhead* (1884); and *Last-chance Junction* (1889).

MACLEAR′, GEORGE FREDERICK (1833-1902). A Church of England scholar. He was born in Bedford, February 3, 1833; graduated at Cambridge B.A. 1855; became headmaster of King's College school, London, 1866; warden of Saint Augustine's College, Canterbury, 1880. In 1885 he was made an honorary canon of Canterbury. His publications embrace: *Introduction to the Prayer Book* (1869); *Apostles of Mediæval Europe* (1869); *The Gradual Conversion of Europe* (1875); *The Conversion of the Celts, the English, the Northmen and the Slavs* (1878-79); *The Evidential Value of the Holy Eucharist* (Boyle Lectures, 1879-80); *Saint Augustine's, Canterbury, Its Rise, Ruin and Restoration* (1888); *Introduction to the Creeds* (4th ed. 1899); and, with W. W. Williams, *Introduction to the Articles* (2d ed. 1896). He edited the Oxford Bible helps (1893), and the Gospel of Mark in the *Cambridge Bible for Schools and Colleges* (1893).

MACLEHOSE, măk″l-hōz, Mrs. [illegible] (1759-1841). A sweetheart of Robert B[illegible]orn in April, 1759. She was a daught[illegible] Andrew Craig, a surgeon of Glasgow. Ro[illegible]bers afterwards described her as of [illegible]hat voluptuous style of beauty, of lively and easy manners, of a poetical fabric of mind, with some wit, and not too high a degree of refinement and delicacy." In 1776, after a brief courtship, she married James Maclehose, a Glasgow lawyer. Owing to the husband's jealousy, they separated four years later. Mrs. Maclehose lived first at Glasgow, and then at Edinburgh, where she was supported by Lord Craig. Her husband sailed for Jamaica. Burns first met Mrs. Maclehose at Edinburgh, December 7, 1787, and a mutual attraction soon grew up. A correspondence ensued in which they addressed each other as Clarinda and Sylvander. Their last meeting, which took place on December 6, 1791, Burns immortalized in "Ae fond kiss, and then we sever," and in three other lyrics. During the friendship Mrs. Maclehose wrote several little poems, one of which Burns thought worthy of Sappho. She joined her husband in Jamaica, was coldly received, and then returned to Edinburgh, where she died October 22, 1841. The correspondence is published in the works of Burns.

McLEN′NAN, JOHN FERGUSON (1827-81). An English sociologist, best known for his theory of exogamy. He was born at Inverness and was educated there, at King's College, Aberdeen, and at Trinity College, Cambridge. In the same year he wrote the article "Law" for the eighth edition of the *Encyclopædia Britannica* and was thus led to study the custom of marriage by capture. This theory was advanced in *An Inquiry Into the Origin of the Form of Capture in Marriage Ceremonies* (1865); in the *Fortnightly Review* (1866, April and May), under the title "Kinship in Ancient Greece," and in the June *Argosy* of the same year in a paper on "Bride Catching;" and further contributions are to be found in his *Studies in Ancient History* (1876), and in "Levirate and Polyandry" (*Fortnightly*, May, 1877) and "Exogamy and Endogamy" (ib., June, 1878). In 1880 he began a study of Maine's theory of the patriarchate, but it was not completed on his death, and was edited in

1885 by Donald McLennan with the title, *The Patriarchal Theory*. McLennan was also a pioneer in the study of totemism, and wrote on that subject for the supplement to *Chambers's Encyclopædia* (1868), and for the *Fortnightly* (October and November, 1869, and February, 1870). A *Memoir of Thomas Drummond* from McLennan's hand appeared in 1867.

McLEOD, măk-loud′, Alexander (1774-1833). A Presbyterian minister. He was born in the island of Mull, came to America in 1792, and graduated at Union College in 1798. The next year he was licensed to preach; he became pastor of the First Reformed Presbyterian Church of New York and remained there till his death. He published: *Negro Slavery Unjustifiable* (1802); *The Messiah* (1803); *Lectures on the Principal Prophecies of the Revelation* (1814); *View of the Late War* (1815); *The American Christian Expositor* (1832-33); and was one of the editors of the *Christian Magazine*. For his life consult Wylie (New York, 1855).

Mc[illegible] Archibald Angus (1848-1902). An Ameri[illegible]ilroad manager and president, born in Co[illegible]County, Quebec. He came to the Un[illegible] while a boy, and after attempting un[illegible]y to run a pottery in Texas became a rodman on the Duluth docks of the Northern Pacific Railroad. Here he became acquainted with Austin Corbin, who made him manager of the Elmira, Cortland and Northern Railroad in 1885, and in 1886 acting general manager of the Reading system. In January, 1887, he was named vice-president and general manager, and in 1890 was elected to the board of managers and then became Corbin's successor as president. He immediately planned a great combination of coal-carrying interests with the Lehigh Valley and the Jersey Central under Reading control and an all-rail route to New England. But a year after the consolidation the Reading passed into a receivership, and McLeod resigned from the presidency to become one of three receivers. The failure of the scheme possibly was due to the opposition of Morgan interests, as well as to the accumulation of a tremendous floating debt.

MacLEOD, Donald (1831—). A Scottish divine and author, second son of Norman MacLeod, a Scotch clergyman (1783-1862), born at Campsie, Berwickshire, March 18, 1831. After graduating from the University of Glasgow he settled as minister, first at Lauder (1858) and then at Linlithgow (1862), and afterwards at Glasgow (1869). Besides holding several high appointments in the Church of Scotland he was chaplain to Queen Victoria. In 1872 he succeeded his brother, Norman MacLeod (q.v.), as editor of *Good Words*, a popular religious periodical. Besides memoirs of his father and his brother, his books include *Sunday Home Service* (1885), and *Christ and Modern Society* (1893).

MACLEOD, Fiona. An English author, born in the Hebrides, where she passed her childhood and youth. Some of her stories and poems illustrating the Gael are remarkable. They are fresh in theme and admirable in execution. She has succeeded better than any one else, except perhaps W. B. Yeats, in gaining a new hearing for Celtic myth and legend. In the dedication of *The Sin-Eater and Other Tales and Episodes* (1895) to George Meredith, she says of her aim: "The beauty of the world, the pathos of Life, the gloom, the fatalism, the spiritual glamour—it is out of these, the inheritance of the Gael, that I have wrought these tales." Besides this volume she has published: *Pharais: A Romance of the Isles* (1894), her first book, which attracted immediate attention; *The Mountain Lovers* (1895); the verse lyrics, *From the Hills of Dream* (1896); *Through the Ivory Gate*, ten poems in the *Fortnightly Review* (1901); *The Immortal Hour*, a drama in two acts, founded on the Celtic legend of Midir and Etain, in the *Fortnightly Review* (1900); *The Silence of Amor*, a series of prose poems (1902); and other prose and verses.

MACLEOD, Henry Dunning (1821-1902). A British financier and political economist. He was born in Edinburgh, was educated at Eton and Cambridge, was called to the bar in 1849, and attained considerable distinction as an authority on economic and financial subjects, attracting attention particularly by his work in connection with the theory of credit. He was also active as a law reformer and codifier; originated many of the changes and improvements in the poor laws of Scotland, and between the years 1868 and 1870 was employed by the British Government in codifying the law of bills of exchange. His publications include: *Theory and Practice of Banking* (1856); *Elements of Political Economy* (1858); a *Dictionary of Political Economy* (1859); and *Principles of Economical Philosophy* (1873).

MACLEOD, James Farquharson (1836-94). A Canadian soldier and civil officer, born in Toronto. He graduated at Queen's University, Kingston, in 1854, and in 1860 became a barrister. In 1856 he entered the militia and in 1867 he was made a major and brevet lieutenant-colonel. For his services during the Red River expedition of 1870 he was created Companion of the Order of Saint Michael and Saint George by the Queen. In 1873 he was appointed captain in the Northwest Mounted Police, and in 1876 he was placed in command of that body and became a member of the Northwest Council. Four years afterwards he was appointed stipendiary magistrate of the Northwest Territories, over all of which he had civil and criminal jurisdiction.

McLEOD, John (1788-1849). A Canadian explorer, born at Stornoway in the island of Lewis, Scotland. In 1811 he came to America and entered the service of the Hudson's Bay Company. He took an active part in the settlements at Selkirk and Winnipeg, and afterwards opened trade routes to the Pacific. For several years he cultivated a large farm, with grist and saw mills, at Vancouver. In 1826 he returned to the Hudson Bay district, where he was placed in charge of the company's work in North America. He died in Montreal, July 24, 1849.

McLEOD, Malcolm (1821-98). A Canadian lawyer and author, a son of John McLeod (q.v.), the explorer. He was born at Green Lake, Saskatchewan, then a part of the Northwest Territories, October 21, 1821. He was sent to Edinburgh, Scotland, for his education; and after studying law in Montreal, he was admitted to the bar in 1845. He became District Magistrate for the counties of Ottawa and Pontiac (1874-76), and Queen's Counsel (1887). His name is especially associated for his important public services with the great Northwest. His exposure of the abuses of the Hudson's Bay Company hastened the surrender of its charter and the incorporation of its territories with the Dominion of Canada (1870). He also published *The Peace River* (1872), made up from his father's journal and his own observations in the Northwest; *Problems of Canada* (1880); and numerous valuable papers on the geography and history of Canada. He died at Ottawa in September, 1898.

MacLEOD, NORMAN (1812-72). A Scottish divine and author, born June 3, 1812, at Campbelltown, Argyllshire, where his father was minister. He was educated at the University of Glasgow, and studied divinity at Edinburgh under Chalmers. He became licentiate in the Church of Scotland in 1837, and the next year was ordained minister of Loudoun in Ayrshire. In the controversy which soon divided the Church he adopted a middle course between the 'evangelicals' and the 'moderates,' producing several able pamphlets. On the disruption he remained in the Church, and became parish minister at Dalkeith (1843). He was one of the founders of the Evangelical Alliance (1847). In 1852 he accepted the Barony parish in Glasgow, where he established the first congregational penny savings bank and opened refreshment rooms for working men and a mission church for the poor. In 1857 he was appointed chaplain to the Queen. In the midst of these and other philanthropic schemes he found time for numerous sketches and essays, in which he reached a wide public. He edited the *Christian Magazine* from 1850 to 1860, and was the first editor of *Good Words* (1860-72). After a visit to Egypt and Palestine in 1864 he published *Eastward* (1866). In 1867 he was sent by the General Assembly to inspect the missions in India. An account of this tour was published under the title, *Peeps at the Far East* (1871). He died at Glasgow, June 16, 1872. Consult *Memoirs*, by his brother, Donald MacLeod (London and New York, 1876).

McLEOD, XAVIER DONALD (1821-65). An American author, born in New York City. He studied at Columbia, and in 1845 took orders in the Protestant Episcopal Church. After preaching for a short time he traveled and studied in Europe, became a Roman Catholic, and on his return engaged in literary pursuits. Subsequently he was made priest, and held the chair of rhetoric and belles-lettres in Mount Saint Mary's College (Ohio). His publications include: *Pynnshurst: His Wanderings and Ways of Thinking* (1852); *Life of Sir Walter Scott* (1852); *Château Lescure, or the Last Marquis;* and two poems, *The Weeder* and *The Saga of Viking Torquil.*

MACLISE, mȧ-klēs′, DANIEL (1806?-70). An English historical painter. He was born in Cork, probably in 1806. He first studied at the Cork Academy, and in 1827 entered the schools of the Royal Academy, winning the gold medal in 1829 for his historical painting "The Choice of Hercules." In 1830-38 appeared his well-known character sketches in *Fraser's Magazine*, in which he displayed great technical skill. He was successful in portrait painting, but gave it up in 1833, after the success of his two pictures, "Snap-Apple Night" and "Mokanna Unveiling His Features to Zelica." He became royal academician in 1840. In 1859 Maclise went to Berlin to study stereochrome, to prepare for the two stereochrome paintings, the "Meeting of Wellington and Blücher at Waterloo," 46 feet long, and the "Death of Nelson," which engrossed much of his later years. He died at Chelsea, April 25, 1870.

The finest works of Maclise are his mural paintings, which are considered by many to be the greatest historical paintings of the English school. He was a good draughtsman, but while his paintings are dexterous, his color is crude, and his pictures are deficient in atmosphere. His frescoes include: "The Spirit of Justice" and "Spirit of Chivalry" (1850), House of Lords; "Marriage of Strongbow and Eva" (1854), and "Alfred in the Danish Camp," Royal Gallery, Parliament House; and "Comus," pavilion of Buckingham Palace. His easel pictures in the National Gallery, London, are "Play-Scene in Hamlet" (1842), "Malvolio and the Countess" (1840), and a portrait of Dickens (1839); in the National Gallery, Dublin, the "Marriage of Strongbow and Eva" and "Merry Christmas in the Baron's Hall." Among his book illustrations are those for Moore's *Irish Melodies*, Lytton's *Pilgrims of the Rhine*, Bürger's *Leonore*, and a series of designs for the *Story of Norman Conquest.* Consult O'Driscoll, *Memoir of Daniel Maclise* (London, 1871).

MACLURE, m'-klōōr′, WILLIAM (1763-1840). An American geologist. He was born in Scotland, emigrated to the United States in 1782, but afterwards returned to London, and made a large fortune in the mercantile business. Again coming to the United States in 1796, he was in 1803 sent abroad as a United States commissioner to settle the French spoliation claims. During this visit to the Continent he studied geology, making large collections of specimens. To accomplish his purpose of executing a complete geological survey of the United States, he visited nearly every State and crossed the Alleghanies fifty times. The result of his researches is found in the *Observations on the Geology of the United States*, read before the American Philosophical Society in 1809, and in a second discussion, read in 1817. With the latter he also presented the first geological map of the United States. In 1819 he went to Spain, and a little later bought from the Government, then in the hands of the Revolutionists, a tract of land, and endeavored to found a sort of agricultural school; but on the downfall of the provisional Government the title to his land failed, and the experiment was abandoned. He afterwards entered upon a scheme of the same kind at New Harmony, Ind., which also was unsuccessful. In 1827 and again in 1828 he went to Mexico, where he died in 1840. His library and most of his collections of maps and charts, with the sum of $20,000 to erect at Philadelphia a building for their reception, were bequeathed to the Academy of Natural Sciences, of which he became president in 1817.

MACLU′REA (Neo-Lat., named in honor of William Maclure). A large flattened gastropod shell, which is a common and characteristic fossil of the lower Ordovician formations of North America and Great Britain. The shell, which coils to the left, has a depressed spire, the apex of which is sunken below the angular keels of the outer whorls, and its lower surface is almost flat. The aperture was closed by a large thick operculum of peculiar form, and these opercula are often found scattered through the rocks. These shells are very abundant in the Chazy limestone of the Champlain and Saint Lawrence valleys, and their spiral cross sections may be seen on the surfaces of black marble slabs quarried in those regions and used in the floors of many public buildings in the Eastern States. See ORDOVICIAN SYSTEM.

MACMAHON, mȧk'mȧ'ôN', MARIE EDME PATRICE MAURICE DE, Duke of Magenta (1808-93). A marshal of France and second President of the Third Republic. He was born at Sully, in the Department of Saône-et-Loire, June 13, 1808, of Irish ancestry. He graduated at the military school of Saint Cyr in 1827, and was attached to the general staff of the army. He was in the campaign of Algiers in 1830 and at the siege of the citadel of Antwerp in 1832. Returning to Africa, he made the long campaigns from the storming of Constantine in 1837 to the battle of Biskra in 1853, and for his brilliant services was rapidly advanced, becoming in 1852 a general of division and commander of the Legion of Honor. In 1855 he was sent to the Crimea, and in the operations against Sebastopol led the successful assault on the Malakoff (September 8th). On returning to France he received the Grand Cross of the Legion of Honor and was made Senator. In 1857 he served against the Kabyles and in the following year was made commander-in-chief of the French forces in Algeria. In 1859, on the breaking out of the war with Austria, MacMahon was put in command of the Second Corps, and on June 4th at Magenta he turned an impending defeat, due to Napoleon's inefficiency, into a great victory. For this achievement he was made a marshal of France and Duke of Magenta. At the battle of Solferino, June 24, 1859, he again had a great share in the victory. In September, 1864, he was once more Governor-General of Algeria. Upon the outbreak of the war with Germany he was placed at the head of the First Army Corps (July, 1870). On August 4th his vanguard was defeated at Weissenburg, and two days later he sustained a crushing defeat at Wörth. He retreated to Châlons and, placed at the head of a newly organized force of 120,000 men, was ordered to march to the relief of Bazaine (q.v.). In this enterprise MacMahon displayed little of his former resolution and dash. His slow advance permitted the Germans to interpose themselves between him and Bazaine, and at Sedan he found himself surrounded by the enemy. (See FRANCO-GERMAN WAR.) This resulted in another crushing defeat for the French (September 1st). MacMahon, who was wounded early in the engagement, was compelled to relinquish the command. On the following day the army was obliged to surrender, together with the Emperor.

In March, 1871, after the preliminaries of peace, Thiers called MacMahon to the command of the Army of Versailles, to recover Paris from the Commune. This he accomplished toward the close of May, after a bloody struggle. After the establishment of peace MacMahon gave his hearty support to the Thiers Government, and after Thiers's resignation in May, 1873, MacMahon was elected President of France. He had been a soldier outside of politics, and was perhaps the one man in France whose patriotism and purity of motive were trusted by all parties; but his election was chiefly due to the monarchical elements, who hoped to use him as a tool for the overthrow of the Republic. On November 19, 1873, his term of office was extended to 1880, this so-called 'Septennate' being aimed at delaying the permanent establishment of the Republic. Nevertheless the Republicans, under the leadership of Thiers and Gambetta, triumphed, and in 1875 the permanent organization of a republican form of government was effected. Charged with favoring Imperialists and seeking to continue in power, MacMahon declared that he should lend his aid to no scheme of monarchical restoration. The conflict with the Republicans continuing, the Chambers were dissolved and both parties went to the country on the issue of the maintenance of the personal authority of the President, whose platform was "defense of the Constitution and conservatism." In 1876 MacMahon was compelled to place Jules Simon (q.v.), whose liberal policy was more in accord with the sentiment of the majority in the Chambers, at the head of the Ministry. In the following year, however, Simon was dismissed and an appeal taken to the country. The action of MacMahon destroyed his popularity with the masses of the people, he was assailed by the press, and the preponderating state of opinion was expressed by Gambetta in his celebrated epigram, "Il faudra se soumettre ou se démettre" ("Give in or get out"). In the new Chamber the Republicans had a majority of 120, and a deadlock ensued between the Ministry and the representatives. There were not wanting those among MacMahon's advisers who urged a coup d'état and the establishment of a dictatorship, but the President was not prepared for such a step. In a message to the Chambers (December, 1877), he acknowledged that the sentiment of the country was in favor of the Republic, pledged himself to rule in accordance with the will of the representatives, and thereafter took little active share in the Government. He resigned the Presidency on January 30, 1879. He died at his estate of La Forest near Montargis, October 17, 1893. Consult: Daudet, *Le maréchal de MacMahon* (Paris, 1883), a brief sketch; id., *Souvenirs de la présidence du maréchal de MacMahon* (Paris, 1880); Stoffel, *La dépêche du 20 Août 1870 du maréchal Bazaine au maréchal de MacMahon* (ib., 1874); and for an exhaustive biography, Lafarge, *Histoire complète de MacMahon, maréchal de France, duc de Magenta* (ib., 1898).

McMAS'TER, GUY HUMPHREYS (1829-87). An American jurist and poet, born at Clyde, N. Y. He graduated at Hamilton College and studied for the bar. Meanwhile he had written *Carmen Bellicosum*, his most popular poem, which first appeared in the *Knickerbocker Magazine* (1849). He was elected judge of Steuben County, N. Y., in 1864, and surrogate of the same county in 1884. He wrote *A History of Steuben County* (1849); his other poems include: *Dream of Thanksgiving Eve* (1864); *The Commanders* (1887); and *The Professor's Guest Chamber* (1880).

McMASTER, JOHN BACH (1852—). An American historian, born in Brooklyn, N. Y. He graduated at the College of the City of New York in 1872, and after spending one year there as a fellow in English, he became a civil engineer. He became known as a writer on engineering subjects and in 1877 was appointed an instructor in civil engineering at Princeton. This position he held until 1883, when he was elected professor of American history at the University of Pennsylvania. In the same year appeared the first volume of *A History of the People of the United States*, designed to cover the period from 1783 to the outbreak of the Civil War. Five volumes had been completed by 1900. It is a work showing great research, particularly in the periodical literature and the newspapers; is written in a lively narrative style and is justly considered one of the standard histories of the period which it covers. Among his other published works are: *Bridge and Tunnel Centres* (1876); *High Masonry Dams* (1876); *Benjamin Franklin as a Man of Letters* (1887); *Origin, Meaning and Application of the Monroe Doctrine* (1893); *A Primary School History of the United States* (1893); *With the Fathers: Studies in American History* (1896); *A School History of the United States* (1897); and *Daniel Webster* (1902).

MacMIL'LAN, Conway (1867—). An American botanist, born at Hillsdale, Mich. He was a graduate of the University of Nebraska, and afterwards studied at Harvard and at Johns Hopkins. In 1891 he was appointed professor of botany at the University of Minnesota, and he was also appointed State botanist. His works include: *Twenty-two Common Insects of Nebraska* (1888); and *The Metaspermæ of the Minnesota Valley* (1892).

MACMILLAN, Daniel (1813-57). The founder of the well-known publishing house, born at Upper Corrie, in the island of Arran, Scotland, September 13, 1813. His father, Duncan Macmillan, a poor farmer, moved to Irvine with his ten children in 1815, where Daniel attended the common school. After serving as apprentice to two booksellers at Irvine and Edinburgh, Macmillan went to London (1833). Liking neither "the London Sunday" nor the terms offered him by Messrs. Simpkin and Marshall, he went to Cambridge, where he found employment with a bookseller named Johnson. In 1837 he returned to London, where, after holding a position for six years with Seeley, of Fleet Street, he opened a shop of his own in Aldergate Street (1843). Toward the end of the same year he bought out Newby's business in Cambridge. In March, 1844, was issued the first Cambridge catalogue of Macmillan & Co. The 'Co.' was represented by Daniel's brother, Alexander, who had charge of the London business, given up later in the year. To bookselling was added publishing, at first on a small scale. The first great successes were Kingsley's *Westward Ho* (1855) and *Tom Brown's School Days* (1857). After the sudden death of Daniel Macmillan on June 27, 1857, the business was carried on by his brother, Alexander Macmillan (1815-96), a publisher of great enterprise and skill. In 1858 he transferred the business to London, and, as trade expanded, he opened a branch house in New York. Among his notable literary undertakings were the Golden Treasury series (1861 seq.) and the Globe editions (1864 et seq.). In 1859 the company began the issue of *Macmillan's Magazine*, the first shilling magazine.—Frederick Orridge Macmillan (born October 5, 1851), a son of Daniel, subsequently became director of Macmillan & Co., Limited, London, and of Macmillan & Co., New York.—George A. Macmillan (born August 1, 1855), son of Alexander, entered the firm in 1879. Consult: Hughes, *Memoir of Daniel Macmillan* (London, 1882); and *Bibliographical Catalogue of Macmillan and Company's Publications* (ib., 1891 et seq.).

MacMILLAN, Hugh (1833-1904). A Scotch clergyman and author. He was educated at Edinburgh University and was minister of the Free Church in Kirkmichael, Perthshire, in 1859-64. He then was transferred to the Free Saint Peter's Church in Glasgow, and in 1878 to the Free West Church, Greenock. He was Gunning lecturer at Edinburgh in 1897. His books, many of which have been translated into European languages, include: *Bible Teachings in Nature* (1866, 24th ed. 1886); *The True Vine* (1871); *The Sabbath of the Fields* (1876); *The Riviera* (1885); *Roman Mosaics* (1888); *The Spring of the Day* (1898); and *Gleanings in Holy Fields* (1899).

McMILLAN, James (1838-1902). An American capitalist and politician, born at Hamilton, Ontario, Canada. Having removed to Detroit in 1855, he was there for a time purchasing agent of the Detroit and Milwaukee Railway Company, and in 1864 assisted in the organization of the Michigan Car Company. From this were developed a car-wheel, an iron furnace, and a steam forge company, of all of which he became president. In 1889 he was elected to the United States Senate, where he retained his seat until his death. His benevolences, particularly in Detroit, were noteworthy. To the University of Michigan he presented one of the most important Shakespeare libraries in the United States.

MACMILLAN, John (1670-1753). Founder of the Reformed Presbyterian Church of Scotland. He was born at Barncachla, Kirkcudbrightshire, studied at Edinburgh, was licensed to preach in 1700, and became minister of Balmaghie the following year. His views were those of the 'remnant' of Cameronians, and, in consequence, his relations with the presbytery were not harmonious. He was deposed in 1703, but continued popular with his people and remained as minister, in spite of attempts to supplant him, till 1715, when he voluntarily withdrew. In 1706 he formally joined the Cameronians and gave the rest of his life to organizing and strengthening the sect. His followers were sometimes called Macmillanites. See Cameronians; Cameron, Richard; Presbyterianism.

McMINNVILLE, măk-mĭn'vĭl. A city and the county-seat of Yamhill County, Ore., 50 miles southwest of Portland; on the Yamhill River, and on the Southern Pacific Railroad (Map: Oregon, B 4). McMinnville College (Baptist) was established here in 1858. The city carries on a flourishing trade in wheat, fruit, hops, live stock, wool and lumber, and has some manufactures. The water-works and electric light plant are owned by the municipality. Population, in 1890, 1368; in 1900, 1420.

McMINNVILLE. A town and the county-seat of Warren County, Tenn., 75 miles southeast of Nashville; on the Nashville, Chattanooga and Saint Louis Railroad (Map: Tennessee, F 5). It has the Cumberland University Training School. The town is surrounded by a fine agricultural region; and there are manufactures of lumber, flour, cotton and woolen goods, furniture, foundry and machine shop products, etc. Population, in 1890, 1677; in 1900, 1980.

MACMONNIES, măk-mŭn′ĭz, Frederick (1863—). An American sculptor. He was born in Brooklyn, September 20, 1863. His father was of Scotch descent and his mother a niece of the American painter Benjamin West. At the age of seventeen he entered the atelier of Augustus Saint Gaudens in New York as an assistant, studying in the evening at the National Academy of Design and the Art Students' League. In 1884 he went to Europe, where, studying painting at Munich and sculpture at Paris, he entered the atelier of Falguière, and after two years' study established an atelier of his own in Paris. His statue of Diana won honorable mention at the Salon of 1889. The statue of Nathan Hale, now in City Hall Park, New York, and that of James S. T. Stranahan, in Prospect Park, Brooklyn, were exhibited in the Salon of 1891. Each of these works is successful, the clever manner in which the unavoidable realism of the Stranahan statue was managed being especially admired by the French critics. In the Salon of 1892 Macmonnies exhibited the little fountain figure called "Pan of Rohallion," and the "Boy with a Heron." The most important of his works, and the one which has done most to secure his reputation, was the colossal fountain in the Court of Honor at the Columbian Exhibition in Chicago in 1893. His statue of a Bacchante, exhibited in the Salon of 1894, was bought for the Luxembourg Gallery. The attempt to place a replica of this statue, now in the Metropolitan Museum, New York, in the court of the Boston Public Library excited much criticism.

The activity of Macmonnies has been very great. His best known works, besides the above, are: the statue of Sir Henry Vane, in the Boston Public Library; the two pediments of the Bowery Savings Bank, in New York; the spandrels of the Washington Memorial Arch, in New York; and the Army and Navy groups for the Soldiers' and Sailors' Monument, in Indianapolis. He did much work for the Congressional Library in Washington, including the bronze doors and a statue of Shakespeare. He also executed the decorations of the triumphal arch at the main entrance to Prospect Park, Brooklyn, and the Battle Monument at West Point. The two groups of athletes and horses at the southern entrance to Prospect Park are as fine examples of park sculpture in bronze as can be found. Since 1900, in which year Macmonnies returned to the United States, he has devoted himself increasingly to painting. Besides other honors, he received a medal at the World's Fair, Chicago, in 1893. He was made Chevalier of the Legion of Honor in 1898, and won a grand prize of honor at the Paris Exposition of 1900. He is above all a brilliant technician. His conceptions are always delicate and refined, his composition unique and original. Consult Greer, "Frederick Macmonnies," in *Brush and Pencil* (1902).

MACMURROUGH, măk-mûr′rŭk, Dermod (Diarmaid Macmurchada) (c.1110-71). King of Leinster in Ireland from 1126 to 1166. In the latter year, being driven out by O'Ruark, Lord of Breifne, whose wife he had abducted fourteen years before, he fled to England and appealed to Henry II. for aid. Henry was unable to go to Ireland in person, but authorized any of his subjects to do so. Richard de Clare, called Strongbow, was the chief leader of the force of adventurers that invaded Ireland and established themselves in the eastern part of the island (see Ireland); he afterwards married Dermod's daughter. Dermod was successful for a time and hoped to conquer all Ireland. Consult Leland, *History of Ireland from the Invasion of Henry II.*, vol. i. (Dublin, 1773). See Henry II., King of England.

McMUR′RY, Charles Alexander (1857—). An American educator, born in Crawfordsville, Ind. He was educated at the Illinois Normal University, the University of Michigan, and the universities of Halle and Jena in Germany. After teaching several years he was principal of the practice school of the Illinois State Normal University (1899-1900), and held the same position at the Northern Illinois Normal School (1900-01). His works include: *Method of the Recitation* (1898), with F. M. McMurry; *Special Method in Reading* (1898); *Special Method in Literature and History* (1898); *Special Method in Geography* (1898); *Special Method in Natural Science;* and *Pioneer History Stories* (1898).

McMURRY, Frank Morton (1862—). An American educator, born in Crawfordsville, Ind. He was educated at the University of Michigan and afterwards studied at Halle and Jena, and in Geneva and Paris. On his return he taught, and in 1891 became professor of pedagogics and training at the Illinois State Normal University. Subsequently he was professor of pedagogy at the University of Illinois (1893-94), principal of Franklin School, Buffalo (1894-95), dean of the Teachers' College, University of Buffalo (1895-98), and in 1898 was appointed professor of the theory and practice of teaching at Teachers College, Columbia University, New York City.

McMUR′TRIE, William (1851—). An American chemist, born at Belvidere, N. J. He graduated at Lafayette College in 1871, and after several years in the United States Agricultural Department, during which he was its representative at the Paris Exposition of 1878 and its special agent in agricultural technology, he was professor of chemistry in the University of Illinois (1882-88), chemist of the experimental station of the same State (1886-88), and then consulting chemist to tartar and baking powder companies. McMurtrie was elected president of the American Chemical Society in 1900. He wrote: *Culture of the Beet* (1880); and *Investigation of Wools and Other Animal Fibres* (1886).

McNAB′, Sir Alan Napier (1798-1862). A Canadian political leader and soldier, born at Niagara, Ontario. He entered the British Navy as a midshipman in 1813 and took part in the expedition against Sackett's Harbor. He left the navy, became an ensign in the army, and took part in the actions at Fort Erie and Black Rock and commanded the advance at the battle of Plattsburg. At the close of the War of 1812-15 he remained in Canada, studied law, and was admitted to practice at the Canadian bar. He was elected to the Legislature in 1830, was twice Speaker of the Legislative Assembly, and was Prime Minister in the Governments of the Earl of Elgin and Sir Edmund Head. He was prominent in sustaining the Government against Mackenzie's insurrection in 1837-38. While he was in command at Niagara, the steamer *Caroline*, employed by American sympathizers to assist the rebels, was, by his order, seized, fired, and sent over Niagara Falls. (See CAROLINE, THE.) This daring act was approved by the home authorities, and McNab was rewarded by being knighted. In 1858 he was made a baronet, and in 1860, after an absence in England, became a member of the Legislative Council.

McNAIR′, FREDERICK VILLETTE (1839-1900). An American naval officer, born at Jenkintown, Pa. He graduated at the United States Naval Academy in 1857, and in 1872 was appointed a commander. During the Civil War he participated in the attacks on Forts Jackson and Saint Philip, the capture of New Orleans and the passage of the Vicksburg batteries. In 1875 he was made commander of the *Yantic* in the Asiatic Squadron, in 1887 commander of the flag-ship *Omaha*, and in 1895 admiral of the squadron. In 1898 he was appointed a member of the Lighthouse Board, and in the same year he was succeeded in command by Admiral Dewey. He was subsequently ordered to take charge of Admiral Cervera and other distinguished Spanish prisoners, and after their return to Spain became superintendent of the Naval Academy.

McNEILE, măk-nēl′, HUGH (1795-1879). Dean of Ripon. He was born in Ballycastle, Antrim, Ireland, was graduated at Trinity College, Dublin, in 1815; studied law in Dublin and London, but after a severe illness turned to the Church; was ordained in 1820 to a curacy in Ireland, and was afterwards rector of Albury in Surrey, and perpetual curate of the Church of Saint Jude, Liverpool; afterwards Saint Paul's Church, in Prince's Park, Liverpool, was built for him. In 1845 he was appointed canon of Chester Cathedral, and in 1860 canon residentiary. He became Dean of Ripon in 1868, but resigned from that position in 1875 and retired to Bournemouth. He was at one time inclined to embrace the doctrines of Edward Irving, but gave them up and reviewed them severely in three sermons on *Miracles* (1831-32), and in *Letters to a Friend who had felt it his Duty to secede from the Church of England* (1834). Other works include collections of sermons: *Lectures on the Prophecies Relative to the Jewish Nation* (1830); *Lectures on the Church of England* (1840); *Lectures on the Sympathies, Sufferings and Resurrection of the Lord Jesus Christ* (1843); *Sermons on the Second Advent of Christ* (1865); *Letters on the Athanasian Creed* (1873); *Scripture Proportions, Illustrated by the Place which the Lord's Supper Occupies in the New Testament* (1873). The first volume of an edition of his collected works appeared in 1877. Consult *Hugh McNeile and Reformation Truth*, with biographical sketch by Bullock (London, 1882).

MACOMB, mȧ-ko͞om′. A city and the county-seat of McDonough County, Ill., 58 miles northeast of Quincy; on the Chicago, Burlington and Quincy Railroad (Map: Illinois, B 3). It is the seat of the Western Illinois State Normal School, and has a public library of over 8500 volumes. The surrounding agricultural region is productive, and the city has extensive manufactures of stoneware and sewer pipe, the vicinity supplying fire clay in abundance. Settled about 1840, Macomb was incorporated in 1857. Under a charter of 1872, the government is vested in a mayor, biennially elected, and a city council. The water-works are owned and operated by the municipality. Population, in 1890, 4052; in 1900, 5375.

MACOMB, ALEXANDER (1782-1841). An American soldier, prominent in the War of 1812. He was born in Detroit, Mich., entered the United States Army as a cornet of cavalry in 1799, and by 1812 had risen to be lieutenant-colonel of engineers and adjutant-general of the army. Soon after the outbreak of the War of 1812 he was transferred to the artillery at his own request, and in 1813, as colonel of the Third Artillery, distinguished himself at Fort Niagara and Fort George. In January, 1814, he was promoted to be brigadier-general and placed in command of the northern frontier, along Lake Champlain, and on September 11th of this year, while McDonough was defeating the English fleet in Plattsburg Bay, he defended Plattsburg, N. Y., against the attack of a greatly superior English force under Sir George Prevost. In recognition of his services on this occasion he was promoted to be major-general, and received a vote of thanks and a medal from Congress. After the war he continued in the service as colonel of engineers, and from 1828 until his death was the commanding general of the United States Army. He published: *A Treatise on Martial Law and Courts-Martial as Practiced in the United States* (1809); and *A Treatise on the Practice of Courts-Martial* (1840). Consult Richards, *Memoir of Alexander Macomb* (New York, 1833).

MÂCON, mȧ′kôɴ′. The capital of the Department of Saône-et-Loire, France, in Burgundy, 40 miles north of Lyons, on the Saône, which is here spanned by a bridge of twelve arches (Map: France, L 5). It has the ruins of the Cathedral of Saint Vincent, begun in the thirteenth century, portions of which are still in good repair; and the modern Church of Saint Peter, a large edifice in the Romanesque style. Mâcon trades extensively in agricultural products and has important watch-making establishments; it is best known, however, as the centre of the Burgundy wine industry. Mâcon is the ancient Matisco, a town of the Ædui. It is the birthplace of Lamartine. Population, in 1901, 18,928.

MACON, mā′kon. A city and the county-seat of Bibb County, Ga., 100 miles southeast of Atlanta; on the Ocmulgee River, and on the Central of Georgia, the Southern, the Georgia Southern and Florida, the Macon, Dublin and Savannah, and the Macon and Birmingham railroads (Map: Georgia, C 3). It is the seat of Mercer University (Baptist), Saint Stanislaus College (Roman Catholic), Wesleyan Female College, which is one of the oldest female colleges in the United States, having been chartered in 1836, Mount de Sales Academy (Roman Catholic), and the State Academy for the Blind. There are two public libraries, a United States Government building, an Academy of Music, armories, and Central City, Tatnall Square, Chickamauga, and Daisy parks. The Indian mounds in the vicinity are also of interest. The city has an extensive trade in cotton, lumber, and general merchandise; and its manufacturing industries are represented by large cotton and knitting mills, lumber mills, foundries and machine shops, flouring mills, etc. Macon was incorporated as a town in 1823, having been settled shortly before, and in 1832 received a city charter. Its present government is administered under a charter of 1893, which provides for a mayor, chosen every two years, who appoints, with the consent of the council, the members of the fire and police department; and a unicameral council which controls elections to the other administrative offices. Population, in 1890, 22,746; in 1900, 23,272.

MACON. A city and the county-seat of Noxubee County, Miss., 110 miles east by north of Jackson; on the Noxubee River, and on the Mobile and Ohio Railroad (Map: Mississippi, H 4). It is the centre of a region largely interested in cotton-growing, and has some industrial establishments, the most important being cottonseed oil mills. Population, in 1890, 1565; in 1900, 2057.

MACON. A city and the county-seat of Macon County, Mo., 70 miles west by south of Quincy, Ill.; on the Chicago, Burlington and Quincy and the Wabash railroads (Map: Missouri, D 2). It has the county insane asylum, a fine court-house, and private educational institutions. The city is the centre of a fertile agricultural section having coal and timber, and there are flour mills, carriage and wagon factories, foundries and machine shops, and manufactories of shears, dishwashing machines, bricks, cigars, etc. The water-works and electric light plant are owned by the municipality. Population, in 1890, 3371; in 1900, 4068.

MACON, Nathaniel (1758-1837). An American political leader. He was born in Warren County, N. C., of Huguenot parentage, and was educated at the College of New Jersey (Princeton). When the Revolutionary War broke out, he left college and enlisted as a volunteer. He was present at the capture of Charleston by the British and at the battle of Camden, and was with Greene in his retreat across Carolina. He left the army in February, 1781, to take a seat as Senator in the Legislature, in which he served until December, 1785. In 1786 he was elected a delegate to the Continental Congress, but declined to serve, being opposed to the State's sending delegates to the old Congress. He vigorously opposed the ratification of the Federal Constitution by the State of North Carolina on the ground that it conferred too much power on the general Government. In 1791 he accepted a seat in Congress, in which he served without interruption until 1815, when he was transferred to the United States Senate. The Republican victory of 1801 led to his election to the Speakership of the House, a position which he filled acceptably until 1806. While a member of the Senate, Macon served as president pro tem. from 1825 to 1827. In politics he was a Jeffersonian Republican of the strict construction school. In 1828 he retired from the United States Senate of his own accord, and until his death in 1837, lived in seclusion on his plantation, except that in 1835 he served as chairman of the North Carolina Constitutional Convention, and in 1836 was a Presidential elector. A biographical sketch of Macon was prepared by E. R. Cotton (Baltimore, 1840). Consult also the *American Historical Review* (New York, 1902).

MÂCONNAIS, mȧ'kō'nȧ'. The name of an ancient district in Burgundy, corresponding to the present Arrondissement of Mâcon, in the French Department of Saône-et-Loire.

MACORIS, mȧ-kō'rĭs. A seaport of the Republic of Santo Domingo, situated on the south coast of the island of Haiti, on the Bay of Dos Rios, 43 miles east of Santo Domingo. It is the seat of a United States consular agent.

MACOUN, mȧ-ko͞on', John (1832—). A Canadian botanist and naturalist, born and educated in Ireland. He came to Canada in his nineteenth year, and in 1868 he was appointed professor of botany and geology in Albert College, Belleville, but resigned his professorship in 1879 in order to accept Government work in connection with an expedition to ascertain the natural resources of part of the Northwest Territories. Subsequently he was employed by the Canadian Government in other scientific work in his department. In 1882 he was appointed botanist to the Geological and Natural History Survey of Canada, and in 1887 was made assistant director of the survey. Several foreign and Canadian learned societies admitted him to honorary membership. In addition to numerous scientific papers and reports he wrote: *Manitoba and the Great Northwest* (1882); and *The Forests of Canada and Their Distribution* (1895).

MACOYA, mȧ-kō'yȧ, or Macahuba Palm. A kind of palm. See Macaw Tree.

McPHER'SON. A city and the county-seat of McPherson County, Kan., 153 miles west by south of Topeka; on the Missouri Pacific, the Union Pacific, the Chicago, Rock Island and Pacific, and the Atchison, Topeka and Santa Fe railroads (Map: Kansas, E 3). It is the seat of McPherson College (German Baptist); and there are fine court house, opera house, and high school buildings. The city is the commercial centre for important agricultural, dairying, and stock-raising interests, and has grain elevators, flour mills, etc. Population, in 1890, 3172; in 1900, 2996.

MACPHERSON, Sir David Lewis (1818-96). A Canadian statesman, born September 12, 1818, at Inverness, Scotland. He was educated there at the Royal Academy. Emigrating to Ontario in 1835, he entered a firm of railroad contractors and was subsequently president of the Interoceanic Railroad Company, which undertook to build a railroad through British Columbia. Having been a member of the Legislative Council of Canada from 1864 to 1867, he was called (1867) to the Dominion Senate, of which he was elected Speaker in 1880. In 1883 he resigned to become Minister of the Interior, a position which he held till 1885. For his services he was knighted in 1884. His publications consist of pamphlets relative to finance, such as *Banking and Currency* (1869). He died August 16, 1896.

McPHERSON, Edward (1830-95). An American journalist, born in Gettysburg, Pa. He graduated at Pennsylvania College in 1848, and studied law, but soon became a journalist. He became prominently identified with the organization in 1856 of the new Republican Party at Harrisburg, where he lived, and in 1858 and again in 1860 was a Republican member of Congress. He was Deputy Commissioner of Internal Revtinue for a short time, and from 1863 to 1873, from 1881 to 1883, and from 1889 to 1891 was clerk of the National House of Representatives. He was permanent president of the Republican National Convention in 1876, in 1877-78 was chief of the Bureau of Engraving and Printing, and from 1878 to 1880 was editor of the Philadelphia *Press*. He became editor of *The Handbook of Politics* in 1872, and from 1877 until his death was editor of the *New York Tribune Almanac*. He was also a political editorial writer on the *Tribune*. He published *A Political History of the United States During the Great Rebellion* (1865), and *A Political History of the United States During Reconstruction* (1870).

MACPHERSON, James (1736-96). 'Translator' of the Ossianic poems, born at Ruthven, Inverness-shire, Scotland, October 27, 1736. After finishing his studies at King's College, Aberdeen, he became a schoolmaster in his native village, published a poem entitled *The Highlander* in 1758, and in the following year, having met Dr. Alexander Carlyle of Inveresk, and John Home, the author of *Douglas*, he showed them some fragments of Gaelic verse, of which he also gave them 'translations.' These 'translations,' sixteen in number, appeared in 1760 under the title *Fragments of Ancient Poetry Collected in the Highlands*. They awakened so much attention that the faculty of advocates in Edinburgh raised a subscription to enable Macpherson to make a tour through the Highlands for the purpose of collecting more ancient Gaelic poems. The result was the publication in London of alleged translations of the poems of Ossian, bearing the titles: *Fingal, an Epic Poem, in Six Books* (1762); and *Temora, an Epic Poem, in Eight Books* (1763). A storm of controversy arose in regard to their genuineness. Blair defended their authenticity; Dr. Johnson called for the Gaelic manuscripts, which were not forthcoming. Scholars are now agreed that though the so-called Ossianic poems are largely the work of Macpherson, yet they have a real basis in Gaelic legend. As a substantial result of his fame, Macpherson was appointed Surveyor-General of the Floridas (1764) with a salary for life, and agent to the Nawab of Arcot (1779). He entered Parliament in the following year as member for Camelford, sat for ten years, and then retired to an estate which he had purchased in Inverness-shire, where he died, February 17, 1796. His body was sent to England and interred at his own request in Westminster Abbey. For the widespread interest in Macpherson's translations and their immense influence on literature, consult: Beers, *English Romanticism* (New York, 1898); for their relation to their originals, *Dean of Lismore's Book*, ed. by MacLaughlan, with introduction by Skene (London, 1862); and *Poems of Ossian*, with translations by Clerk (Edinburgh, 1870). Consult also *Poems*, trans. by Macpherson, with introd., ed. by Todd (London, 1888); *Life and Letters*, by Saunders (London, 1894). See Ossian.

McPHERSON, James Birdseye (1828-64). An eminent American soldier, prominent on the Federal side in the Civil War. He was born in Sandusky, Ohio; graduated first in his class at West Point in 1853, having as classmates such men as Philip H. Sheridan, John B. Hood, and John M. Schofield; and was appointed to the Corps of Engineers, with the rank of brevet second lieutenant. For a year after his graduation he was assistant instructor of practical engineering at the Military Academy, and was next engaged from 1854 to 1857 as assistant engineer upon the defenses of the harbor of New York and the improvement of Hudson River. In 1857 he superintended the building of Fort Delaware, and in 1857-61 was superintending engineer of the construction of the defenses of Alcatraz Island, at San Francisco, Cal. Upon the outbreak of the Civil War he was assigned to duty at Boston, where he raised a force of engineers; and in August, 1861, he was promoted to be captain of engineers. The following November he was made aide-de-camp to General Halleck, and assistant engineer of the Department of the Missouri, with the rank of lieutenant-colonel. From February to April, 1862, he served as chief engineer on the staff of General Grant, taking part in the capture of Fort Donelson and in the battle of Shiloh. In May, 1862, he was appointed brigadier-general of volunteers and colonel in the Regular Army. He was with Halleck at the siege of Corinth; and when, after its capture by the Federal forces, the Confederates under Van Dorn and Price attempted to retake it in October, 1862, McPherson succeeded in penetrating their lines and reënforcing Rosecrans, who was holding the place with a force much inferior to that of the Confederates. For his services at Corinth, McPherson was made major-general of volunteers October 8, 1862. In December he was put at the head of the Seventeenth Corps, and had a distinguished share in Grant's Mississippi campaign, which terminated in the surrender of Vicksburg. After the fall of Vicksburg, McPherson was, upon the recommendation of General Grant, appointed a brigadier-general in the Regular Army and commander of the District of Vicksburg. In February, 1864, he was second in command to Sherman in the latter's expedition to Meridian, and on March 12th was made commander of the Department and Army of the Tennessee. In that command he maintained the reputation he had won in Mississippi, and rendered valuable service during Sherman's campaign in Georgia. The Army of the Tennessee engaged the Confederates at Resaca May 14th and 15th and at Dallas May 28, 1864; and on June 27th McPherson aided Thomas in an unsuccessful assault upon Johnston's position at Kenesaw Mountain. Shortly thereafter he was engaged in the series of conflicts around Atlanta, in one of which, on July 22, 1864, he was killed, while making a reconnoissance. General Grant, in a letter recommending him for promotion in 1863, praised him as "one of the ablest engineers and most skillful generals," and in his *Personal Memoirs*, says: "In the death of McPherson the army lost one of its ablest, purest, and best generals."

McQUAID, m'-kwād', Bernard John (1823—). The first Roman Catholic Bishop of Rochester, N. Y. He was born in New York City; studied at Chambly College, near Montreal, and then entered Saint John's College at Fordham, N. Y., where he graduated in 1843. He was ordained a priest in 1848, and was sent to New Jersey, where he founded Seton Hall College and Seminary, of which he was president for ten years, though for part of that time also rector of the cathedral in Newark. In 1868 he became

Bishop of Rochester. He devoted himself especially to organizing parochial schools.

MACQUARIE, mȧ-kwŏr′ĭ. An Australian river, a tributary of the Darling (q.v.).

MACRAUCHENIA, mă′kr̤a-kē′nĭ-ȧ (Neo-Lat., from Gk. *μακραύχην*, *makrauchēn*, long-necked, from *μακρός*, *makros*, long + *αὐχήν*, *auchēn*, neck). A fossil ungulate mammal of the size of a camel, found in the Pleistocene beds of Argentina. Although of a generalized type, it somewhat resembled the camels in respect of the length and structure of its neck. The muzzle was provided with a short proboscis. The feet were three-toed, with the toes about equal in size.

MACREADY, măk-rē′dĭ, William Charles (1793-1873). A noted English tragedian. He was born in London, March 3, 1793, the son of a provincial theatrical manager, and was educated at Rugby. He first played as Romeo at Birmingham in 1810. For four years he took leading parts in his father's company, and two years later, in September, 1816, made his first appearance before a London audience as Orestes in *The Distressed Mother*, winning the applause of Kean. Macready's progress in the higher walks of the drama was slow, however, largely on account of professional jealousies. In 1819 he made a hit in the character of Richard III., and afterwards adventured on others of Shakespeare's characters with success. In 1826 he made a tour of the United States, and visited Paris in 1828. He became lessee of Covent Garden Theatre in 1837, and his management, though brief, was distinguished by the high character of his company and his productions. Later he managed Drury Lane for a time, but without pecuniary success. He visited America a second time in 1843-44; and again in 1848-49, when he barely escaped with his life from a riot which took place in the Astor Place Opera House at New York (May 10, 1849), as a result of the jealousy of the American actor Edwin Forrest. On his return home Macready was engaged at the Haymarket, but his theatrical career was brought to a conclusion with his farewell benefit at Drury Lane, on February 26, 1851. He died at Cheltenham on April 27, 1873. Macready was a fine and impressive player, and a conscientious student of his art. He succeeded best in the graver characters of the drama, having more of the stateliness of Kemble than of the fire of Kean. Consult his *Reminiscences, and Selections from His Diaries and Letters*, edited by Pollock (London and New York, 1875); Lady Pollock, *Macready as I Knew Him* (London, 1884); Archer, *William Charles Macready* (London, 1890); Baker, *English Actors from Shakespeare to Macready* (New York, 1879); Lewes, *On Actors and the Art of Acting* (ib., 1878); Marston, *Our Recent Actors* (London, 1890).

MACRI′NUS, M. Opelius (a.d. 164-218). A Roman Emperor. He was a native of Mauritania and became pretorian prefect under Caracalla, whom he caused to be assassinated on the expedition against Parthia in a.d. 217. He was at once chosen Emperor by the army, and the Senate confirmed the choice. He fought against the Parthians, neither side gaining a decisive victory, made terms with them, and returned to Antioch. His severe discipline aroused the anger of his soldiers, who were gained over by the relatives of Caracalla, and after a reign of fourteen months he was defeated near Antioch, and murdered in his flight.

MACRO′BIUS, Ambrosius Theodosius. A Latin grammarian of the early fifth century. He appears to have been by birth a Greek, but nothing whatever is known of his life. Two of his works remain, entitled *Commentarius ex Cicerone in Somnium Scipionis*, and *Saturnaliorum Conviviorum Libri Septem*. The former is the best known, and was much read during the Middle Ages; the latter is in the form of a dialogue, and contains many valuable historical, mythological, antiquarian, and critical observations. Of a third work, *De Differentiis et Societatibus Græci Latinique Verbi*, we possess only extracts made by one Joannes, thought to be Scotus. The *editio princeps* of Macrobius appeared at Venice in 1472; of later editions the best are those of Jan (2 vols., Quedlinburg, 1848-52) and Eyssenhardt (Leipzig, 1893).

MAC′ROPE′DIUS, Georg (c.1475-1558). A philologist and dramatist of the Netherlands, whose real name was Lankveld. He was born at Gemert; was a member of the community of Saint Jerome, founded by Gert Groote; and taught at Bois-le-Duc, Liège, and Utrecht. He was an excellent scholar, as the times went, in languages, mathematics, and science, but takes his place in the history of literature through two volumes of Latin plays. Of these a collected edition was published at Utrecht in 1552, and several were rendered into German. Consult Jacoby in the *Allgemeine Deutsche Biographie*, vol. xx. (Leipzig, 1884).

MACROPOMA, măk′rô-pŏ′mȧ (Neo-Lat., from Gk. *μακρός*, *makros*, long + *πῶμα*, *pōma*, cover, lid). A fossil fish of the order Crossopterygii, found preserved in fine condition in the chalk beds of the English Cretaceous formations. The body was about eighteen inches in length, of stocky form, and was covered with overlapping ganoid scales. The head was protected by rather heavy bones. The fins are simply lobate and consist of anterior and posterior dorsal, an anal, a pair each of pectoral and pelvic, and a broad caudal fin. The air bladder was ossified and is often found preserved in the better specimens. See Ganoid.

MAC′ROSPORAN′GIUM. A spore case. See Megasporangium.

MAC′ROSPORE. The larger of the two kinds of spores of higher plants. See Megaspore.

MAC′ROSPOR′OPHYLL. In higher plants, the structure that bears macrospores. See Megasporophyll.

MACROZA′MIA (Neo-Lat., from Gk. *μακρός*, *makros*, large + *ζαμία*, *zamia*, loss; so called because of the sterile appearance of the male fructification). A genus of about a dozen species of plants of the natural order Cycadaceæ, widely distributed over Australia. The fronds, which somewhat resemble those of palms, are used in the Roman Catholic Church on Palm Sunday. The underground stem, which is large and turnip-like, but covered with scales or leaf-scars, contains a substance resembling tragacanth, and is rich in starch, which may be readily obtained by grinding and washing. All the species contain a poisonous principle that is destroyed by heat. The nuts of *Macrozamia spiralis* are edible, but are used only in times of scarcity. Some of the species are often seen in greenhouses.

MACRU'RA. See CRUSTACEA.

MACRU'RUS (Neo-Lat., from Gk. *μακρός*, *makros*, long + *οὐρά*, *oura*, tail). The type genus of a family of fishes (Macruridæ), which are closely allied to the cods, seeming degenerate representatives of the stock, and differing chiefly in the elongate and degenerate condition of the posterior part of the body, which tapers to the thin, much compressed tail. (See Plate of CODFISH AND ALLIES.) All are pelagic and most of them inhabit the deeps, and have the characteristics of deep-sea fishes. Bathygadus is another prominent genus. Consult Goode and Bean, *Oceanic Ichthyology* (Washington, 1896). See DEEP-SEA EXPLORATION.

MACÚ, mȧ'kōō'. One of the lowest tribes of the Amazon region, with no fixed residence, but wandering nearly the whole length of the Rio Negro, principally to the west of it, in Northwestern Brazil. They are naked and without houses, but stitch a few palm leaves together to serve as a shelter at night in case of rain. They live entirely by hunting and fishing, using poisoned arrows, and are hostile to other tribes. Their hair is wavy and almost curly. They must not be confounded with the Maca (q.v.), or with the Maco of the Upper Orinoco.

MACULA (Lat., spot). A macule, spot, or stain, of limited area and circumscribed, without elevation or depression of surface. MACULÆ is a term used in dermatology of not only macular diseases, but also some vesicular and papular affections, including nævus, ephelis, spilus, moles, etc.

MACUL'LA. A town of Arabia. See MAKALLAH.

MacVEAGH, măk-vā', WAYNE (1833—). An American lawyer and Cabinet officer. He was born at Phœnixville, Chester County, Pa., graduated at Yale in 1853, and was admitted to the bar in Westchester, Pa., in 1856. From 1859 to 1864 he was district attorney of Chester County. He became one of the Republican leaders in Pennsylvania, and was elected chairman of the State Central Committee of that party in 1863. He also attained great distinction at the bar. In 1870-71 he was United States Minister to Turkey, and in 1871 led the fight in Republican State politics against Simon Cameron, his father-in-law. In 1872-73 he was a prominent member of the Pennsylvania Constitutional Convention. In 1877 he was chairman of the 'MacVeagh Commission,' sent by President Hayes to represent him unofficially in Louisiana, and secure an amicable adjustment of the political differences in that State. In March, 1881, he entered the Cabinet of President Garfield as Attorney-General, but resigned on the accession of President Arthur, and resumed his law practice. He supported Cleveland for the Presidency in 1892, and from 1893 to 1897 was Ambassador to Italy. In 1896 and 1900, however, he again supported Republican candidates.

MacWHIRTER, măk-whẽr'tẽr, JOHN (1839—). A Scotch painter, born at Inglis Green, near Edinburgh. He ran away from home and became a pupil of the art school of the Board of Manufacturers, Edinburgh. Ruskin praised his sketches of flowers, and used them in his Oxford class. The most characteristic of his works are his noble Highland landscapes. In 1869 he took up his residence in London, and in 1877 made a visit to the United States, where he executed some notable studies of Californian scenery.

MACY, mā'sĭ, JESSE (1842—). An American historian, born in Henry County, Ind. He graduated at Iowa College in 1870; was immediately appointed to the faculty, and became professor of constitutional history and political science in 1885. Macy published: *Civil Government in Iowa* (1881); *Institutional Beginnings in a Western State* (1883); *Our Government* (1886); *The English Constitution* (1897); and *Political Parties in the United States, 1846-61* (1900).

MADÁCH, mŏ'däch, IMRE (1823-64). An Hungarian poet, born in the county of Nógrád. He studied law and became notary for his district. In 1861 he published a dramatic poem called *Az ember tragédiája* ("The Tragedy of Man"), which was considered the best of its kind that had appeared in Hungary. There are several German translations (1865-90). His collected works were published by Paul Gyulai in 1880.

MAD'AGAS'CAR (corrupted from *Magadaxo*; formerly called by the natives *Izao rehetra Izao*, this whole, i.e. world, and *Ny anivon ny riaku*, [land] in the midst of the flood). The fourth largest island in the world, being surpassed in area only by Greenland, New Guinea, and Borneo. It is situated in the Indian Ocean off the southeast coast of Africa, from which it is separated by Mozambique Channel. It lies between latitudes 11° 58′ and 25° 35′ S., and longitudes 43° 19′ and 50° 27′ E. It is 980 miles long and 358 miles in its greatest width, with an area (including the few adjacent islets) of 228,500 square miles (estimated), or about two and one-half times that of Great Britain (Map: Africa, J 6).

TOPOGRAPHY AND GEOLOGY. Madagascar may be divided into two distinct regions. The central and the eastern parts of the island, or more than half of it, are very mountainous and are formed of primitive rocks of igneous origin, except for a narrow fringe of sedimentary rocks along the coast. Gneiss, and particularly granitoid gneiss, predominates; there are also many granite dykes, and, here and there, basalts, the cones of ancient volcanoes, magnetite, and other iron ores, and numerous hot springs. The gneiss, decomposed to great depths, forms the reddish, clayey soil that covers most of these highlands. The volcanic centres (now extinct) of this region are Mount Ankaratra in the central region, the culminating summit of the island (nearly 9000 feet high), Mount Amber near the north end of the island, and Ivohitsombe near the southeast coast, north of Fort Dauphin. These highlands, the primitive land mass, rise from 3000 to 6000 feet above the sea.

The western and southern regions and a considerable district in the north are comparatively low, not much over 600 feet above sea-level, and are built up of sedimentary rocks, of Permo-carboniferous, Secondary and Eocene strata. Here also are many volcanic cones, that have pierced through the sedimentary fossiliferous beds. The lowlands, broken by some ranges of hills extending north and south, rise gently to the central highlands, and the rivers have excavated numerous valleys, so that the west of the island is, for the most part, a deeply dissected plain. The coasts are in the main comparatively straight with no deep indentations. The northwest coast, however, is broken up by great inlets, some of them landlocked, so that Mojanga and a few other bays are among the largest and finest of natural harbors. Elsewhere the island is poorly supplied with good ports for shipping.

HYDROGRAPHY. Naturally, the rivers that are most important in an economic sense flow down the western slope across the plains to Mozambique Channel. The largest of these western rivers are the Betsiboka, the Tsiribihina, the Mangoka, and the Onilahy, all navigable for some distance by small vessels, and the Betsiboka for about 100 miles. The eastern rivers are torrential streams making their short course to the sea through gloomy but magnificent gorges under the shade of the densest forest growths. The largest of these rivers is the Mangoro. The only lake of importance is the Alaotra, among the mountains of the northeast. South of Tamatave, on the east coast, is a series of lagoons which the French have connected by 30 miles of canals, making an inland waterway about 100 miles long.

CLIMATE. Owing to its geographical position and the considerable elevation of a large part of the island, Madagascar has both the temperate and tropical climates. The centre, with a mean elevation of about 4000 feet, has a temperate climate with a dry and wet season and a temperature rarely rising above 72°. Here white men can best live and labor. The east has a warm and humid climate with rain nearly every day in the year, the precipitation at Tamatave, for example, being over 90 inches in a year. The hot west coast has a dry and a wet season. All the coast regions are very unhealthful. The south of the island is marked by long periods of drought. Sometimes not a drop of rain falls in a year.

FLORA. The flora is very rich and varied; three-fourths of the species are endemic and there are almost 4000 indigenous species; but from a botanical point of view the east, west, centre, and south differ greatly. The east, receiving the larger rainfall, has extensive forests of tropical timber including many valuable species. A large part of the centre, on the contrary, being comparatively dry, is almost destitute of vegetation. It is only around the villages and along the rivers that trees and cultivated lands are found. The reason is that the moisture-laden winds from the Indian Ocean part with their water vapor on the eastern slopes of the mountains and west of the crests there is much smaller rainfall. In the west are found large expanses of prairies adapted for extensive cattle-raising, with here and there clumps of timber and isolated trees. A belt of forest parallels the west coast at some distance from it, but it is by no means so luxuriant as the eastern forests. Cacti and euphorbias are found in the dry south, where the botanical aspects of the country resemble those of the dry plateaus of Mexico.

FAUNA. See MALAGASY SUBREGION.

ECONOMIC CONDITION. In spite of its size and abundance of natural wealth, Madagascar is only beginning to be turned to important economic account. Agriculture and cattle-raising are the chief industries, and are capable of large expansion. The chief products are rice (318,000 hectares in 1901), manioc (constantly growing in area), sugar, coffee, cotton, cacao, vanilla, and sweet potatoes. Madagascar has about 1,600,000 head of cattle, and the herds increased by 300,000 head in 1901. Gold, copper, iron, lead, sulphur, and a few other minerals exist. Gold was obtained in 1898 to the amount of $66,000; 1899, $215,000; 1900, $698,000; the exhaustion of some of the placer diggings reduced the output in 1901. The manufacturing industries are confined chiefly to the weaving of silk, cotton, and palm fibres, which is done exclusively on hand looms.

COMMERCE. While the oversea trade of Madagascar is increasing every year, most of it is with France. The preferential tariff in favor of France reduces the trade with other countries. In 1901, 13,440 vessels of 2,458,952 tons visited the ports. The value of the total external commerce of the colony was 55,000,000 francs in 1901, as against 51,000,000 in 1900. The imports were valued at 46,000,000, and the exports at 9,000,000 francs, four-fifths of the trade being in commodities brought into the country. The most important import is French cotton cloth. The Malagasy as well as Europeans regard the amount of their purchases of cotton cloth as the criterion of the island's prosperity. Rice has the second place among the imports, though Madagascar should be a rice-exporting country. The apathy and indolence of the natives are responsible for the insufficiency of the rice crop, but the stimulus the French authorities are giving to this industry is expected soon to make the crop at least sufficient for the home needs. The chief articles of export are gold, raphia (fibre), and beef cattle. The chief ports in order of importance are Tamatave, Mojanga, and Antseranana. The French are expending large sums to improve interior communications, and business was stimulated in 1902 by the completion of the wagon road from Antananarivo (q.v.) to the east coast, where there is a water route through the lagoons to Tamatave. A railroad between the east coast and Antananarivo is also building. There is regular steamship service between Madagascar and Marseilles.

The administration of the island has been since 1897 in the hands of a Governor-General, assisted by an administrative council. The interior part of the island is administered by residents and vice-residents under the supervision of the Governor-General. The French Government maintains here (1903) a military force of about 16,000 men, of which over 8,000 are natives. The expenditures of France on Madagascar for 1903 amounted to over 27,000,000 francs. The revenue of the colony shows an increase from a little over 9,000,000 francs in 1897 to about 22,000,000 francs in 1902. The revenue is obtained from taxation, which is very heavy. Madagascar has a considerable debt. It has three banks, two of them branch institutions. The system of using forced native labor is still practiced. There are elementary schools provided by the Government, in which the French and Malagasy languages are taught, as well as agricultural and industrial schools. There are four normal schools, a school of medicine, and a professional school. The colony has a system of courts.

POPULATION. Madagascar has a population of approximately 2,500,000. The chief races are the Hovas, who number about 1,000,000, and live in the central highlands, the Sakalavas, and the Betsimisarakas. A number of them have been converted to Christianity, but the majority are still in a state of paganism. Malagasy, a language closely related to those of the Malay Peninsula and Polynesia, is spoken all over the island. The number of Hindus and Chinese is small, and they are mostly engaged in trade. Antananarivo is the largest city of the island, and is the capital.

The administration is inviting French colonists to settle in the more salubrious parts of the island, particularly soldiers whose term of service in Madagascar has expired. Land is given free to French immigrants. In 1901, 1674 colonists were settled upon 135,618 hectares of land and were doing well.

ETHNOLOGY. The generic term for the natives of Madagascar is Malagasy. Of their three principal tribes, the Hovas are Indonesians, more or less mixed with Malay. They are supposed to be the last wave of the Malay migration, coming about eight centuries ago. They have straight black hair and olive yellow skin; their eyes are sometimes narrow; their stature is short, their noses prominent and sharp; their head is globular. Agriculture, cattle-raising, and trading are their occupations. Their principal food is rice. Many customs and arts pointing to their ancestral home are preserved, as the square pile house, bellows, outrigger canoe, musical instruments, dress, taboo, infanticide, ordeal, burial, and the like. The Hovas were until recently the ruling people on the island and were gradually subjecting the other tribes, to which they are much superior in culture. They were divided into nobles, freemen, and slaves. In recent years, however, these class distinctions became weaker and the royal and slave classes were finally abolished by the French. They are nominally Protestants in religion. The principal tribes of the Hovas are the Voromahevy, Tsimianboholahy, Tsinahafoty, Mandiavato, Marovatana, and others. The Betsileos living to the south should also be placed with the Hovas.

The Betsimisarakas are less pure than the Hovas and are dolichocephalic; they are below the average height and have curly or almost smooth hair and light chestnut complexion. They are rather backward in culture and show influences due to the Arabs who settled in Madagascar about five centuries ago. The principal tribes are the Antambahoaka, Antaimoro, Antaifasina, Antaisaka, Antaisara, Antanosi, Tanala, and Sihanaka. They were conquered by the Hovas early in the nineteenth century.

The Sakalavas are dark, long-headed, and of high stature; their hair is frizzly, their lips thick, and their noses flat. Most strongly of all the Madagascar tribes they show the negro element. The best-known tribes are the Menabe, Milaka, Ronondra, and Mahafali.

HISTORY. The identity of Madagascar with the ancient Minuthias has been conjectured, but not proved. The island appears on Arabian charts of the twelfth century and it is probable that Arab traders visited the country as early as the eighth or ninth century. Marco Polo used the name *Madeigascar*, but apparently applied it to what is now Mozambique, on the mainland of Africa. The discovery of the island by the Portuguese occurred, not in 1506 as is generally stated, but in 1500, when, according to Grandidier and Reclus, Diego Suarez sighted the land and named it São Lourenço. Attempts at settlement made before 1540 by the Dutch, English, and Portuguese failed, but in the seventeenth century the French set up a claim to Madagascar, or Dauphiné, as they called it, and in 1642 Louis XIV. granted it to the *Compagnie de l'Orient*. Stations were established at Sainte-Marie and Fort Dauphin, but the rule of the French was so cruel that the natives rose in 1672 and massacred them. France regained Sainte-Marie in 1750, lost it to Great Britain during the Napoleonic wars, and reoccupied it after 1815, together with Tamatave, Fort Dauphin, and Sainte-Luce. French influence, however, made little progress owing to the rise of the powerful monarchy of the Hovas, a people of the central plateau, who, under the leadership of Andrianampoinimerina, had subjugated the greater part of the island. During the reign of Radama I. (1810-28) the British gained the ascendency. English officers drilled the Hova troops and English missionaries introduced schools and the Christian religion. Under Queen Ranavalona I. (1829-61) a strong reaction from European ideas occurred. Reforms were abolished, the missionaries were persecuted, and trade relations with England were broken off. An unsuccessful attack on Tamatave by the English and French in 1845 led to a general massacre of Christian converts. After 1853, however, the Europeans regained an entrance into the capital, Antananarivo, through the influence of Prince Rakoto, heir to the throne. As Radama II. Rakoto showed himself friendly to the French, and undertook to restore the reforms of Radama I. He was murdered by the conservative faction at Court. Though Queen Ranavalona II. adopted Christianity in 1869, the Hova Government remained jealous of European aggression and took measures to prevent the foreign acquisition of land in the island. In 1883 the invasion of French territory and the plundering of French citizens led to the bombardment of Tamatave. After two years' fighting Madagascar, by treaty, became virtually a protectorate of France, though it retained its nominal independence. Renewed hostility on the part of the Hovas was followed in 1895 by the dispatch of a French expedition under Duchesne, which occupied Antananarivo and forced Queen Ranavalona III. to confirm the treaty of 1885. In 1896 Madagascar was declared a colony of France, though the native Government was retained, and a proclamation was issued abolishing slavery. The same year the outbreak of a rebellion in which the Court was found concerned led to the deposition of the Queen and the institution of a military government. The former Queen was exiled to Réunion, and afterward to Algeria.

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and a late account of Roman Catholic Missions is Colin and Sua, *Madagascar et la mission catholique* (Paris, 1895). For the fauna, consult: Pollen and Van Dam, *Recherches sur le faune de Madagascar* (5 vols., Leyden, 1868); for the people, McLeod, *Madagascar and Its People* (London, 1865); Oliver, *Madagascar, and the Malagasy* (London, 1866); Carol, *Chez les Hova, au pays rouge* (Paris, 1898); for Madagascar as a colony, and for the French occupation, Leroy, *Les français à Madagascar* (Paris, 1803); Routier, *Les droits de France sur Madagascar* (Paris, 1895); Maude, *Five Years in Madagascar* (London, 1895); Brunet, *La France à Madagascar* (Paris, 1895); Knight, *Madagascar in War Time* (London, 1896); Hanotaux, *L'affaire de Madagascar* (Paris, 1896); Olivier, *Ce qu'il faut connaître de Madagascar* (Paris, 1895); Dawson, *Madagascar, Its Capabilities and Resources* (London, 1895); Burleigh, *Two Campaigns: Madagascar and Ashantee* (London, 1896); Duchesne, *Rapport sur l'expédition de Madagascar* (Paris, 1897); Mager, *Nos colonies, La vie à Madagascar* (Paris, 1898); Mignard, *Etude sur l'établissement de la domination française à Madagascar* (Paris, 1900); Gallieni, *La pacification de Madagascar* (Paris, 1900); Hellot, *La pacification de Madagascar* (Paris, 1900). Other works are: Martineau, *Madagascar* (Paris, 1894); Paisant, *Madagascar* (Paris, 1896); Sibree, *A Madagascar Bibliography* (London, 1885); id., *Madagascar Before the Conquest* (London, 1896); Johnston, *The Colonization of Africa* (Cambridge, 1899); Foucart, *Madagascar: Commerce, Colonisation* (Paris, 1899); Keller, *Madagascar, Mauritius and Other East African Islands* (London, 1900).

MADAGASCAR (in zoögeography). See Malagasy Subregion.

MADAGASCAR CAT. A lemur (q.v.).

MADAME BOVARY, mȧ'dȧm' bô'vȧ'rē'. The most notable romance of Gustave Flaubert. It is a realistic picture of the degeneration in character of a woman, the victim of an imagination excited by the reading of romantic tales to despise the commonplace. The heroine, wearied with the monotony of her husband's character, and seeking the experience of a romantic passion, falls a victim to a vulgarian, Rodolphe, who abandons her. Her second lover is a law clerk, Léon, who proves to be a sensual coward and who abandons her when she appeals to him for money to pay debts which she has recklessly incurred. In desperation at her inability to discharge these debts she poisons herself. She retains the love of her simple-minded husband to the end.

MADAME CHRYSANTHÈME, krē'säɴ'-tâm'. A romance by Pierre Loti (1887), which is concerned with the author's alleged experiences in a temporary marriage with a Japanese girl.

MADAME SANS-GÈNE, säɴ'zhân'. A play by Sardou and Moreau, produced at the Vaudeville, Paris, in 1893. The personages are Napoleon I. and the homely characters whom he was uplifting into courtiers. The play owed its success partly to its setting and its brilliant reproduction of the times.

MAD'AN, Martin (1726-90). An English preacher. His father, a colonel, was a member of Parliament, and his mother was an aunt of the poet Cowper. From Westminster School he passed to Christ Church, Oxford, where he graduated B.A. in 1746. In 1748 he was called to the bar. Impressed by Wesley's preaching, he gave up his profession; and, with the aid of Lady Huntington, who had turned Methodist, he was admitted to holy orders. He was appointed chaplain to the Lock Hospital in London, where he became widely known. In 1780 he published *Thelyphthora,* a book in which it was argued that polygamy is in accord with the Mosaic law and with Christianity rightly understood. The work created a sensation. Madan resigned Lock Hospital and retired to Epsom, where he died May 2, 1790. Besides the famous *Thelyphthora,* Madan published a score of other books and pamphlets, including several on polygamy, translations of Juvenal and Perseus, and a collection of psalms and hymns. He was author of the hymns "Lo, He Comes," and "Hark, the Herald Angels Sing."

MAD ANTHONY. A nickname given to Major-General Anthony Wayne because of his reckless daring in the American Revolution.

MAD APPLE. See Sodom, Apple of.

MAD CAVALIER. A name given to Prince Rupert of Bavaria, nephew of Charles I. of England.

MADDALONI. mäd'dȧ-lō'nē. A city and railway centre in the Province of Caserta, Italy, 14 miles north-northeast of Naples (Map: Italy, J 6). It is situated in a finely irrigated and fertile district. Three ancient castles and the Church of San Michele stand on a height above the city. In the vicinity is the famous Caroline aqueduct which supplies Caserta with water. The principal industries are quarrying and weaving. Population (commune), in 1881, 19,270; in 1901, 20,682.

MAD'DEN, Sir Frederick (1801-73). An English antiquary, born in Portsmouth. He entered the service of the British Museum in 1826 as a cataloguer; two years later was made assistant keeper of the department of manuscripts; and in 1837 keeper. In 1834 he was gazetted one of the gentlemen of the privy chamber. The foremost paleographer of his time, he continued to hold his post in the British Museum until 1866, when he retired, devoting the remainder of his life to antiquarian and literary study. He edited the metrical romance of *Havelok the Dane* (1833); *Layamon's Brut, or Chronicle of Britain* (1847); and Matthew Paris's *Historia Anglorum* (1866-69).

MADDEN, Richard Robert (1798-1886). An English traveler and author, born in Dublin. He studied medicine, and in 1855 was appointed a fellow of the Royal College of Surgeons. In 1833 he was sent to Jamaica as one of the special magistrates to administer the Emancipation Act. Because of difficulties with the planters, he resigned in 1834, and in 1836 was appointed a judge in the Mixed Court at Havana. He was in 1841 a member of the inquiry commission to report on slave-trade conditions on the African West coast. From 1843 to 1846 he was Lisbon correspondent of the London *Morning Chronicle,* in 1847 was Colonial Secretary of Western Australia, and from 1850 to 1880 was Secretary of the Loan Fund Board of Dublin Castle. His chief works are: *The United Irishmen, Their*

Lives and Times (1843-46), and *The History of Irish Periodical Literature* (1867).

MADDER (AS. *mædere, mæddre,* Icel. *maþra,* madder), *Rubia.* A genus of plants of the natural order Rubiaceæ, very nearly allied to the genus Galium or bed-straw (q.v.), and differing from it chiefly in having a juicy fruit resembling two small berries growing together. The species are found in the tropical and warmer temperate parts, both of the Old and the New World, and are important for the coloring matter of their roots. The most important is the common madder or dyer's madder (*Rubia tinctorum*), a native, probably, of the south of Europe as well as of Asia and now cultivated in most European countries, and also in the East Indies, China, etc. It is a perennial, with weak stems and whorls of 4-6 elliptic or lanceolate glossy leaves, the stem and leaves rough with sharp prickles; small greenish-yellow flowers, and black fruit. The Turkish madder (*Lizari* or *Alizari*) was probably the earliest in use, but the French variety, grown in the vicinity of Avignon, is now considered the best. In the Levant the plants are plucked when five or six years old; but in Europe they are allowed to grow only two or three years. The best quality, known as *crop-madder,* is that which is freed from the brown outer crust before grinding. *Mull-madder,* the most impure variety, is obtained by grinding rootlets, the woody parts of the root, brown outer crust, and all. From the madder-roots are also prepared, by fermentation and filtration of the separated dye-colors, the commercial extracts known as *madder-flowers* and *garancine.* The importance of madder and madder preparations has almost entirely disappeared with the development of the artificial manufacture of alizarin. Consult Sadtler, *Industrial Organic Chemistry* (Philadelphia, 1900). See ALIZARIN.

MADDER FAMILY. A popular name for an order of plants. See RUBIACEÆ.

MADDER LAKE. See PAINTS.

MAD′DERN, MINNIE. An American actress. See FISKE, MINNIE MADDERN.

MADEIRA, mȧ-dē′rȧ, *Port. pron.* mȧ-dā′rȧ. The chief of the Madeira Islands, in the Atlantic Ocean, about 400 miles west of Morocco, just south of the parallel of 33° north latitude (Map: Portugal, E 5). It is about 38 miles long and 12 miles broad, and has an area of about 300 square miles. Its surface is rough and diversified with high peaks and deep valleys; it is traversed by a ridge of mountains, attaining in Pico Ruivo an altitude of 6056 feet above the sea. Their average height is estimated at 4000 feet, and the more elevated peaks are often covered with snow. Madeira is of volcanic origin, and although it has no active volcanos at present, there are numerous traces of lava streams. The scenery is magnificent, the deep valley known as the Curral das Freiras being especially picturesque. The coasts are generally high, with precipitous, rocky cliffs, reaching in Cabo Girao a sheer height of 1934 feet. The climate of Madeira is remarkable for its uniformity and salubrity, and the island is regarded as one of the best of health resorts. The average temperature at the coast for the year is about 68°, that of the coldest month being about 60°, and that of the warmest 73°. The island is, however, exposed to the deadly 'leste' ('east wind'), or hot sand storm from the Sahara Desert. The absence of rain during the summer necessitates a complete system of irrigation. The water is stored up during the rainy season on the hills and distributed in the summer by means of channels. The vegetation of Madeira is one of the richest, and includes more than 80 species of plants peculiar to the island. In addition to European grains and fruits, there is an abundance of bananas, figs, grapes, apricots, custard apples, mangoes, oranges, pineapples, and citrons. The fauna is less varied; there are no indigenous mammals, and no snakes, though lizards and turtles are found. Birds, however, are very numerous, and are characterized by a remarkably bright plumage. The most common species is the wild canary. The wine industry, which was introduced from Crete in the sixteenth century and for which the island is famous, is still very extensive, the annual export amounting to about 700,000 gallons, although it has considerably declined since the grape disease of 1851-52. Besides wine the island produces sugar, tobacco, and coffee. Among the other industries may be mentioned lace-weaving, wood-carving, and the manufacture of cigars. The whole province (see MADEIRA ISLANDS) had in 1900 a population of 150,528 inhabitants of mixed Portuguese, Moorish, and negro descent. The dominant religion is Roman Catholic, but the Church of England and the Free Church of Scotland are also represented. The island is connected by steamship lines with the United States, Great Britain, France, Belgium, Portugal, and the not distant Canary Islands. The capital is Funchal (q.v.). Madeira is supposed to have been known to the Phœnicians in ancient times. It was rediscovered by the Portuguese explorer João Gonçalvez Zagro in 1419, and colonized about thirty years later. In 1580 the island fell into the hands of the Spaniards, but was restored to the Portuguese in 1640. In 1801 and from 1807 to 1814 Madeira was occupied by the British, but since then it has remained in the possession of Portugal. Consult Biddle, *The Madeira Islands* (London, 1900).

MADEIRA. The principal tributary of the Amazon (Map: Brazil, E 5). It is formed on the boundary between Bolivia and Brazil by the union of the Mamoré and the Beni, and flows northeastward with numerous windings, forming in a part of its course the boundary between the Brazilian States of Matto Grosso and Amazonas. It enters the Amazon about 50 miles below the mouth of the Rio Negro after a course of about 900 miles from the confluence of its headstreams, and about 2200 miles from the remotest source of the Mamoré. For the first 200 miles below the junction the Madeira flows through rocky gorges in a series of falls and rapids ending in the Falls of São Antonio, 715 miles from its mouth. Below this point it is a majestic river nearly a mile wide, and navigable for ocean steamers during nine months of the year, and for steamers drawing eight feet at all seasons. A railroad past the falls was begun in 1877, but after a few miles of track were built the scheme was abandoned. The vast forest region through which the river flows is almost wholly undeveloped, to a large extent unexplored, and almost uninhabited, save by tribes of Indians and by rubber-gatherers, who have made a number of settlements along the banks, this being one of the chief rubber-producing regions in the world. The name Madeira, which means 'timber,' was given to the river on account of the great quantities of driftwood sent down by the current.

MADEIRA ISLANDS. A group of islands in the Atlantic Ocean, west of Morocco, forming a province of Portugal, under the name of Funchal (Map: Portugal, E 4). It consists of the island of Madeira, the small neighboring island of Porto Santo, and the islet of Deserta Grande, the last of which, together with a number of mere rocks hardly worthy of the name of islands, is uninhabited. The area of the group is 315 square miles, of which about 300 square miles are included in Madeira. The population is almost wholly confined to the island of Madeira (q.v.). Consult: Hartung, *Geologische Beschreibung der Insel Madeira und Porto Santo* (Leipzig, 1864); Schultze, *Die Insel Madeira* (Stuttgart, 1864); Johnson, *Madeira, Its Climate and Scenery* (London, 1885); Biddle, *The Madeira Islands* (London, 1900); Brown, *Madeira and the Canary Islands with the Azores* (London, 1901).

MADEIRA NUT (Port., wood). The Persian or English walnut. See Walnut.

MADELEINE, mȧd′lân′, La. A noted church in Paris, on the square of the same name. The work was intrusted to the architect Coutant d'Ivry and the foundation was laid by Louis XV. in 1764. Upon the death of Coutant d'Ivry in 1777 his successor, Couture, changed the design, and substituted the present plan. Work on the edifice was suspended at the Revolution, and Napoleon in 1807 decided to convert it into a Temple of Glory, under the architect Vignon. The original name was resumed in 1816, and after an interruption due to the Revolution of 1830, the work was completed in 1832 by Huvé, at a cost of $3,000,000. The church has the form of a Roman Corinthian temple surrounded by columns, sixteen of which form the south portico. It stands on a basement 23 feet high, and is 354 feet in length, 141 in breadth, and 100 feet high. The tympanum of the south façade is filled with a relief by Lemaire, representing Christ as the judge of the world. The bronze doors, 34½ feet high and 16 feet broad, are by Triqueti. The building has no windows and is lighted from above. On the ceiling of the choir is a fresco by Ziegler, the "History of Christianity." The church contains a number of large paintings and sculptures. The high altar, by Marochetti, represents Mary Magdalen borne to Paradise by two angels.

MADELEINE, La. A prehistoric station near Tursac, in the valley of the Vézère, Dordogne, France, from which the Magdalenian epoch was named. This epoch occurred near the close of the Paleolithic period, and was characterized by a cold, dry climate, the extinction of the mammoth, and the existence of man in association with reindeer. The habitations were rock shelters, caves, and open stations or villages on low ground and in the ancient tundras. Besides the bear, the fauna presents the curious mixture seen at this day on the Amur—tigers and panthers existing with reindeer, blue foxes, Arctic hares, and other polar species.

The man of the Magdalenian period was of low stature (62.5 inches), dolichocephalic, with low and retreating forehead and prominent brow ridges. He was a hunter and knew how to chip piercing blades from flint, and the women were leather workers and seamstresses, for skin-scrapers and bone needles have been found in great abundance. The chief interest of the Magdalenian man is his art. He could etch on bone and carve on reindeer antlers the animals with which he was familiar, producing his effects by scratching and scraping. The term Magdalenian epoch is applied to conditions and activities similar to those of La Madeleine; among the stations of this class are Bruniquel, Cambous, Laugerie Basse, Les Eyzies, Chancelade, Chaleux, and Spy.

MADELEINE, Marie Angélique de Sainte. A prioress of Port Royal, celebrated in connection with the Jansenist controversy. See Arnauld, Jacqueline Marie.

MADELON, mȧd′lôN′. In Molière's *Précieuses ridicules*, one of the characters who give the piece its name. She calls herself Polixena.

MADEMOISELLE, mȧ′de-mwä′zĕl′. A local name about Pensacola for the fish 'yellowtail' (q.v.).

MADEMOISELLE DE LA SEIGLIÈRE, *de* lȧ sȧ′glyâr′. A romance by Jules Sandeau (1848), dealing with the relations between an émigré noble, the Marquis de la Seiglière, and his former tenant, Stamply, who on the return of the Marquis restores his possessions, which had been sold during the Revolution. The plot is formed by the devotion of Stamply, unquestioningly accepted by the nobleman, the return of Stamply's son, who was believed to have been killed in battle, and his love for the daughter of the Marquis. A comedy based on the romance by Sandeau was presented in 1851.

MADEMOISELLE DE MAUPIN, mō′păN′. A novel by Théophile Gautier (1835). As a work of art the romance is a masterpiece of literature, but its ethical attitude is in opposition to all moral standards. In it the author represents a girl who disguises herself in men's clothes and sets out to gain a wider knowledge of the other sex than is permitted by the laws governing social relations. In the outcome the heroine and hero, having learned to know each other, are separated.

MADERNA, mȧ-dĕr′nȧ, Carlo (1556-1629). An Italian architect, born at Bissone near Como. He was called to Rome as a youth by his uncle, Domenico Fontana the architect, to assist him in his work, and soon became widely known, and received the patronage of the Popes Clement VIII. and Paul V. Under Paul he was appointed architect of Saint Peter's, and proceeded to complete it after his own designs. The Greek cross, which had been Michelangelo's plan, was altered to a Latin cross, and he lengthened the whole edifice, thereby destroying much of its harmony. His portion of the work was finished in 1612; the side porches were added by Bernini. Maderna also erected the two great fountains of Saint Peter's. He grew in fame and fortune, and many works of importance in Rome were given to him. He designed churches and palaces in Spain and France as well as in other parts of Italy, but did his best work in Rome. Among various notable edifices by him in that city are the Palazzo Mattei (1602), the Palazzo Odescalchi, the continuation of the Palazzo Quirinale, the Palazzo Barberini (completed by Bernini and Boromini), and the Borghese Palace.

MĀDHAVA, mäd′hȧ-vȧ, **MĀDHAVACHĀRYA**, mäd′hȧ-vȧ-chä′ryȧ. An eminent Hindu scholar, royal counselor and divine, who lived in the fourteenth century of our era. He was elder brother of the famous Vedic commentator Sāyana (q.v.), and flourished under King Bukka I. (A.D. 1350-79), whom he served as Prime Minister and spiritual adviser. This ruler belonged to the dynasty of Vijaya-nagara, 'City of Victory,' now Hampi, in the District of Bellary, South Central India, which is said to have been Mādhava's birthplace. He was associated with the Monastery of Sringiri, of which he became abbot. The list of his works on philosophical, religious, and technical subjects is a long one. Consult Klemm, "Mādhava, seine Lehre und seine Werke," in the *Gurupūjākaumudī, Festgabe zum Doctorjubiläum Albrecht Weber* (Leipzig, 1896). The name Mādhava is frequently found earlier in Sanskrit literature and Hindu mythology as an appellation of the god Vishnu (q.v.) or his incarnation, Krishna.

MADHUCA, mä′dụ-kȧ. A tropical tree. See BUTTER-TREE.

MA′DIA (Neo-Lat., from *madi*, the Chilean name), *Madia*. A genus of annual upright plants of the natural order Compositæ. The yellow ray flowers are shortly ligulate, those of the disk tubular; the seeds without pappus but very viscid, rich in oil which is expressed. *Madia sativa*, which attains a height of three to five feet, is cultivated under the names madi or melosa in Chile, where it is native and from whence, early in the nineteenth century, it was taken to Europe, where it has been cultivated to some extent since 1839 as an oil plant. Madia oil is richer than poppy oil, almost entirely inodorous, of a bland, agreeable taste, and very suitable for oiling machines, as it does not solidify even at 10° F. The oil-cake is a good food for cattle. The flowers ripen gradually in succession, so that they first ripen their seeds which fall off before the last flowers open, a great disadvantage in a crop. Another species, *Madia elegans*, is cultivated in flower-gardens.

MAD′ISON. A city and the county-seat of Morgan County, Ga., 68 miles east by south of Atlanta; on the Georgia and the Central of Georgia railroads (Map: Georgia, C 2). It is in the cotton belt of the State, and has a large trade in this commodity; and its industries are represented by cotton compresses, cottonseed oil and fertilizer works, a chair and furniture factory, etc. There is a public library. Population, in 1890, 2131; in 1900, 1992.

MADISON. A city and the county-seat of Jefferson County, Ind., 50 miles north by east of Louisville, Ky.; on the Ohio River and on the Pittsburg, Cincinnati, Chicago and Saint Louis Railroad (Map: Indiana, D 4). The city has steamboat connection with important places on the river, and a large shipping trade. There are a marine railway and shipyards, ship lumber yards, foundries and machine shops, tanneries, saw and flour mills, and cotton and woolen mills —the various industries, according to the census of 1900, representing a capital of $1,553,000 and having a production valued at $2,146,000. Madison, first incorporated in 1824, is governed under a charter of 1836 which provides for a mayor, elected every two years, and a unicameral council that elects all administrative officials except the clerk, treasurer, and marshal. The city owns and operates the water-works. Population, in 1890, 8936; in 1900, 7835.

MADISON. A borough in Morris County, N. J., 26 miles by rail west of New York City, and 4½ miles southeast of Morristown; on the Lackawanna Railroad (Map: New Jersey, D 2). It is the seat of Drew Theological Seminary (q.v.); is popular as a suburb for Newark and New York business men; and has a public library and a fine public park, the latter having been improved at an expense of $200,000. The only important industry is that of flower culture, rose-growing being the most important specialty. Madison was settled before the Revolution, and was incorporated as a borough in 1889. The government is vested in a mayor, chosen biennially, and a council, elected on a general ticket. The borough owns and operates the water-works and electric light plant. Population, in 1890, 2469; in 1900, 3754.

MADISON. A city and the county-seat of Lake County, S. D., 60 miles south of Watertown; on the Chicago, Milwaukee and Saint Paul Railroad (Map: South Dakota, H 5). It is the seat of a State Normal School. Madison is in a farming and stock-raising region from which it derives considerable trade, and there are several grain elevators. The water-works and electric light plant are owned by the municipality. Population, in 1890, 1736; in 1900, 2550.

MADISON. A city, the capital of Wisconsin and the county-seat of Dane County, 83 miles west of Milwaukee; on the Chicago and Northwestern, the Chicago, Milwaukee and Saint Paul, and the Illinois Central railroads (Map: Wisconsin, D 5). A widely noted educational and summer resort, it lies in the attractive Lake country (at an elevation of 788 feet above the sea, and 210 feet above Lake Michigan), between Lakes Mendota, Monona, and Wingra, and near Lakes Waubesa and Kegonsa. A system of beautiful parked suburban drives, carefully macadamized and nearly thirty miles in length, is maintained by popular subscription. The State House, whose chief attraction is a handsome dome, stands in a well-kept park. The finest building in the city —indeed the finest State structure in Wisconsin —is the library and museum building of the State Historical Society, situated a mile west of the State House, opposite the State University campus; it is an Ionic, colonnaded structure, built of Indiana limestone, and cost $700,000. The society's reference library of 240,000 volumes is one of the most famous of American libraries. Within the building are also housed the libraries of the State University and the Wisconsin Academy of Sciences, Arts, and Letters. There are; in addition, a free public library (for which a new building, donated by Andrew Carnegie, is (1903) being erected) and the State Law Library (in the State House), besides those of several educational institutions. Madison is the seat of the University of Wisconsin (q.v.); and the State Hospital for the Insane and the State fish hatchery are in the suburbs.

The city has wide-spread commercial interests throughout southwestern Wisconsin, and manufactories of agricultural implements, machinery, tools, flour, boots and shoes, carriages and wagons, and electrical appliances; there are also several large printing establishments engaged chiefly in manufacturing law-books and ready-print newspapers. The government is administered, under revised charters of 1889 and 1901, by a mayor, biennially elected, and a unicameral council which controls elections of subordinate officials. The water-works are owned and operated by the municipality. Population, in 1890, 13,426; in 1900, 19,164.

Soon after the organization of the Territory in 1836 this site was chosen for the location of the State capital; and the first house, erected in March, 1837, was for boarding and lodging the workmen on the projected Capitol. In 1839 the necessary Territorial building had been built, and since then Madison (named for President James Madison) has been the regular seat of government. It was chartered as a city in 1856. Consult Durrie, *A History of Madison* (Madison, 1874).

MADISON, James (1749-1812). First Protestant Episcopal Bishop of Virginia. He was born near Port Republic, Va., and graduated at William and Mary College in 1772. He was admitted to the bar, but gave up the profession of the law for the ministry. In 1773 he became professor of natural philosophy in William and Mary. In 1775 he visited England and was made a priest in that country. Two years later he was chosen president of William and Mary. He was consecrated Bishop of Virginia in 1790 by the Archbishop of Canterbury in the chapel of Lambeth Palace, and thereafter performed the duties of his episcopal office in addition to those of college president and professor. He published sermons and occasional papers and a *Eulogy on Washington* (1800), and prepared a map of Virginia.

MADISON, James (1751-1836). An eminent American statesman, fourth President of the United States. He was born at Port Conway, Va., March 16, 1751; entered Princeton College in 1769, and after his graduation in 1771 undertook the study of law. While only twenty-three he served on the Committee of Safety of his county, and two years thereafter, in 1776, was a delegate to the Revolutionary convention of Virginia. In this body he was a member of the committee appointed to draft a constitution, in connection with which work he rendered notable aid to Jefferson in his agitation for the complete toleration of all religious denominations. Madison was sent to the first Legislature elected under this Constitution; in the following year he was one of the executive council, and in 1780 he was sent to the Continental Congress, where for three years he served with marked credit. He again became a member of the Virginia Legislature in 1784, where he was particularly attentive to the problem of the relations of the States under the Confederation and strongly favored the calling of the Annapolis Convention of 1786, although for political reasons he was not a member himself. At the same time Madison, as a member of the Legislature, was again contending for religious toleration, and also for sound public finance. In 1787 he was again elected to Congress, then in its decadence, and in the same year served in the Constitutional Convention at Philadelphia. In that body he was the author of what became known as the 'Virginia plan,' and throughout rendered such manifold and effective service as to win for himself the title of the 'Father of the Constitution.' He was an untiring advocate of the principle of proportional representation in the upper as well as the lower House of the National Legislature. Madison coöperated with Hamilton and Jay in the production of the *Federalist* (q.v.), about 30 of the 80 papers of that work being attributed to him. Of inestimable value to the Supreme Court in the interpretation of the Constitution were the notes of the debates which he kept and which were published by the Government after his death (3 vols., Washington, 1843).

Upon his return to Virginia, Madison was chosen a delegate to the Constitutional Convention called to take action on the new Constitution, and in the critical contest in that body he led the Federalists and gained a substantial victory over Henry, Mason, Lee, and the other opponents of the Constitution. The Anti-Federalists, however, were so strong in the Legislature that Madison failed in his candidacy for the Senate, chiefly through the influence of Patrick Henry, although he was elected to the first House of Representatives, defeating James Monroe, a moderate Anti-Federalist. He served in that body for four terms, until the retirement of Washington from the Presidency, and as party lines were gradually drawn he became recognized as the ally of Jefferson, and as the leader in the House of the Anti-Federalist opposition to the policy of Alexander Hamilton (q.v.). He proposed the resolutions for the creation of the first three executive departments (those of State, Treasury, and War), proposed a series of twelve amendments to the Constitution, out of which were formed the first ten amendments as finally adopted, and took an important part in the framing of the first tariff act. The direction of business in the House was to a large extent intrusted to him. A further contribution in the formative period of the Government was his insistence upon the President's power to remove his Cabinet officers without the concurrence of the Senate. Upon matters involving party policy, from the time of his definite break with Hamilton, he followed the normal course of his associates, opposing Great Britain, and particularly the Jay Treaty (q.v.), refusing to approve fully the Administration's policy with reference to the manner of paying the domestic debt, and taking a position of vigorous hostility to the establishment of a national bank. His enemies finally attempted, and with some success, to connect him with the questionable political journalism of Freneau and others. With Jefferson he tried to discredit Hamilton and was charged with the authorship of the Giles resolutions attacking the management of the Treasury. He warmly supported the resolution calling upon the President for the instructions given to Jay and led the attack upon the President's reply. Madison's four years of retirement (1797-1801) were broken by brief service in the Virginia Legislature (1799-1800), and by his noteworthy contribution to political literature, popularly known as the Virginia Resolutions of 1798. (See VIRGINIA AND KENTUCKY RESOLUTIONS.) Upon the success of the Jeffersonian Republicans in 1801 Madison was named by Jefferson as Secretary of State, and retained the office throughout both terms of his chief. The administrative routine of this service was broken in the early years by the negotiations leading to the purchase of Louisiana and by the strained relations with the Barbary States. The later years, however, produced a series of problems of difficulty and importance, turning largely upon the theories maintained by England as correct principles of international law. It thus fell to the lot of Madison to direct the fruitless mission of William Pinkney to England, and to take action at the time of the search of the *Leopard*. The policy of embargoes had been adopted, the war of commercial retaliation had been begun, and the conduct of England and France in regard to American commerce had reached a critical point, when the second term of Jefferson ended and the power of the 'Virginia dynasty' was attested by the election to the Presidency of Madison, who was Jefferson's candidate, and who received 122 out of 175 electoral votes. His first term was occupied largely by the diplomatic difficulties with England, culminating in a request for the recall of the English Minister, and by the protracted dealings with France with reference to the commercial decrees of Napoleon. The anti-English faction gained control of Madison's party, and their activity, coupled with that of the younger pro-war element, finally secured the acquiescence of the President in the Congressional policy of war against England. War was declared by the United States on June 18, 1812. At the outset the Americans suffered serious reverses on land, but on the sea they won a succession of triumphs. Madison was reëlected to the Presidency in 1812, receiving 128 votes, 89 being given to his opponent, De Witt Clinton, who had been set up by a coalition of Federalists and the New York wing of the Republican Party. The war with England lasted almost through half of Madison's second term. Madison's Presidency witnessed the complete overthrow of the Federalist organization. The old Federalist principles of a strong national government were now largely adopted by the dominant Republican Party, as illustrated by the increased appropriations for the army and navy and by the reëstablishment of the national bank, in all of which Madison concurred, although he differed with his party upon the warmly contested point of the propriety of making appropriations of national money for public improvements. Upon these matters, as upon the subject of the tariff, neither sectional nor party lines were permanently drawn in Madison's time. Upon his withdrawal from public service Madison retired to Montpelier, Va., where after a period of twenty years of quiet and leisure he died, June 28, 1836. In later life he took much interest in popular education and devoted himself to promoting the interests of the University of Virginia. His last public service was in the Virginia Constitutional Convention of 1829, where his frail and venerable figure commanded the most profound attention and respect. His wife, formerly Mrs. Dorothea (familiarly known as 'Dolly') Payne Todd, who lived until 1849, was for many years a conspicuous figure in Washington society. Her biography has been written by M. W. Goodwin (New York, 1897). The *Letters and Writings* of Madison were published in 1865 (Philadelphia), and a new edition of his *Writings* was edited by Gaillard Hunt (New York, 1900). John Quincy Adams wrote a biography of Madison (Boston, 1850); W. C. Rives prepared a more complete *Life and Times* (Boston, 1859-69). The history of Madison's Administration is ably treated by Henry Adams in his *History of the United States from 1801 to 1817* (New York, 1889-90). Consult also the biography by Gay, *James Madison* (Boston, 1884; in the "American Statesmen Series"). A calendar of Madison's correspondence appeared in Bulletin No. 4 of the Bureau of Rolls and Library, Department of State (Washington, 1894). For an account of Madison's Administrations, see the article, United States.

MADISON BARRACKS. A United States military post in New York, established in 1813 and occupying a reservation of 90 acres, on Black River Bay, 10 miles from Lake Ontario, adjoining Sackett's Harbor, which is the post-office and telegraph station. A rifle range of 806 acres has been established at Stony Point, 18 miles from the post. There are quarters for 30 officers and 600 infantry.

MADISON SQUARE GARDEN. One of the largest buildings devoted to amusement, located in the heart of the City of New York. It contains an amphitheatre accommodating 15,000 people, and used for horse-shows, circuses, bicycle races, and similar purposes, a theatre, a concert and ball room, a restaurant, a roof garden, and a number of studios. The building is of buff brick and terra-cotta and is notable for its great tower, over 300 feet in height, modeled after the Giralda at Seville.

MAD'ISONVILLE. A city and the county-seat of Hopkins County, Ky., 38 miles south of Henderson; on the Louisville and Nashville Railroad (Map: Kentucky, D 3). It is the centre of a fine agricultural country, and has an important tobacco trade and various industrial plants, including saw and planing mills, flour mills, a tobacco factory, tobacco stemmeries, a coal mine, etc. Natural gas has been discovered in the vicinity. Population, in 1890, 2212; in 1900, 3628.

MÄDLER, mā'dlĕr, Johann Heinrich (1794-1874). A German astronomer, born in Berlin. He began to study natural science at the University of Berlin in 1822, and in 1830 was appointed an instructor in the Berlin Normal School. As the result of his astronomical observations he published a map of the moon in 1834-36, and in the latter year was chosen assistant in the Berlin Observatory. In 1837 he published his *Allgemeine Selenographie*, and in 1840 was made director of the observatory at Dorpat, Russia. There he made extensive researches in regard to the fixed stars, and in 1846 published *Die Centralsonne*, propounding the theory, now discarded, that the centre of the stellar universe is located in the Pleiades. In 1865 he returned to Germany. His works in connection with variable and double stars is of great value, and established him among the eminent astronomers of the century. His further publications include *Der Fixsternhimmel* (1858) and *Geschichte der Himmelskunde* (1872-73).

MADNESS. See Insanity; Lunacy.

MAD'OG (commonly **MADOC**) **AB O'WAIN GWYNNEDD,** gwin'nĕᴅ (c.1150-80?). A Welsh prince and the reputed discoverer of America. The story is that Madog was compelled by civil strife to leave his native land, that he sailed westward in 1170, and reached a new land whose productions and inhabitants were quite unlike those of Europe. This land is assumed to have been America. He returned to Wales, equipped a second expedition and set sail again, but never returned. The earliest extant mention of Madog is in a poem by Maredudd ap Rhys, who lived in the middle of the fifteenth century. No reference is made to discoveries in the West. In 1584 Dr. David Powel edited and published Humphrey Llwyd's [or Lloyd] translation of *Brut y Tywysogion*, with additions of his own, under the title of *The Historie of Cambria*, and first gave the story of Madog's alleged discovery to the world. Very probably he found the adventure in Llwyd's work. There is no mention of Madog in the original Welsh *Brut y Tywysogion*. The theory of a Welsh discoverer of America was received with considerable enthusiasm in Wales, but during the last century its adherents have gradually disappeared. Some arguments in its behalf, derived from words in the Indian languages supposed to resemble Welsh, and from the reports of a tribe of fair-haired and light-skinned Indians, assumed to be descendants from Madog's colonists, may be found in Catlin, *North American Indians* (ed. 1854). Consult also: Stephens, *Literature of the Kymry* (2d ed., p. 130 et seq.); Stevens, *Madoc* (London, 1873). Powel's edition of Lloyd or Llwyd was reprinted in London in 1811.

MADON'NA (It., my lady). A word specially applied to the Virgin Mary which has become common in other languages, particularly to describe the Virgin in works of art. Early Christian art only very occasionally portrayed the Virgin. If alone, she stood with arms extended in prayer, as emblematic of the Church or the Saved Soul: this figure of the *Orans* (praying figure) is sometimes inscribed Virgo Maria, but not in the earliest examples. The Virgin enthroned and holding the child did not become popular until after the Council of Ephesus in 431 had declared her the Mother of God. Byzantine art of the sixth and following centuries created the type of Youthful Virgin that was to be retained in art up to the Renaissance. The apocryphal lives of the Virgin and of the Child Christ, so popular in literature, furnished themes for art, among the earliest being the scenes in the mosaics of Santa Maria Maggiore in Rome (c.432). Characteristically, the color of her robe was blue, starred or slashed with gold, and it was represented draped over her head. As Christian iconography (q.v.) developed, the scenes in which the Virgin figured increased, coming at last to include all the recorded events of her earthly life. Later her death (described by Pseudo-Dionysius c.500 A.D.) and her ascent into heaven also became art themes. Finally in the Last Judgment and scenes from the Apocalypse she appears, usually as intercessor, on one side of Christ.

There is an uninterrupted series of paintings and sculptures from the time of the mosaics of Sant' Apollinare Nuovo at Ravenna to the Gothic period, showing how systematically Byzantine art created a Life of the Virgin, and how mediæval Western art borrowed these scenes and developed them. It remained for Gothic art to embody the further apotheosis of the Virgin so characteristic of the age of the Troubadours and the Minnesingers, of Saint Bernard and of the cathedrals all dedicated to the Virgin. She is there represented, as in the mosaic of Santa Maria in Trastevere (c.1140) or the fresco by Orcagna in the Campo Santo at Pisa, or the sculptured portal of Notre Dame in Paris, as raised into the divine sphere by the side of her Son. Raphael's Sistine Madonna is one of the most beautiful later representations of her as Queen of Heaven. Murillo portrays another favorite theme of the late Renaissance, the Virgin as the woman of Revelations with the moon or the globe under her feet. Still later came the Virgin of the Seven Sorrows, with pierced heart.

It was during the Gothic period that the devotion to the Virgin developed the artistic scene of the Virgin and Child, the most often repeated of any in art between the thirteenth and sixteenth centuries. Guido of Siena, Cimabue, and Duccio painted its most beautiful early examples. Fra Angelico, Filippo Lippi, Ghirlandajo, Giovanni Bellini, Perugino, and a host of other painters followed in the fifteenth century. The scene, which was at first very simple, the Virgin and Child being accompanied merely by angels, or adored by the Magi or Shepherds, became complicated. The Magi were accompanied by a caravan of attendants; Saint John, Saint Catharine, and other figures were introduced, as has been explained under HOLY FAMILY, and saints and fathers of the Church were added in the principal or in accessory scenes.

When applied to a painting or a sculptured group, the term "Madonna" usually signifies a representation of the Virgin and the Christ child, either alone or accompanied by saints, who are, however, accessories to the principal subject. It is to be distinguished from such similar themes as the "Holy Family" (q.v.), the "Mater Dolorosa," or the "Immaculate Conception." The best-known Madonnas were painted by Italian artists, by whom the theme was chiefly developed.

The emancipation from the stiff Byzantine type of the Madonna was effected in the latter thirteenth century by a number of Italians, chief among whom was Cimabue (q.v.). The two best examples of his Madonnas are in the Florentine Academy and in the Ruccelai Chapel, Santa Croce. While retaining the gold background and the stiff Byzantine type, they show many natural motifs. His younger contemporary, Duccio of Siena, went much further, achieving a more ideal, if freer, as may be seen in his chief work, the altarpiece of the Cathedral of Siena still preserved there. Fra Angelico (1387-1455) repeatedly treated the subject, the best known examples being the "Madonna of the Star," in the Convent of San Marco (for illustration, see ANGELICO), and the lifesize "Madonna Enthroned," surrounded by the well-known angels (Uffizi, Florence)—both severely archaic in treatment. The first artist to break with this conventional treatment was Fra Filippo Lippi, who portrayed the Madonna and Child as the incarnation of maternal love and childish innocence. One of his best known examples is the beautiful "Virgin Worshiping the Child," lying on a flowery sward in a summer landscape (Berlin Museum); another, in the Uffizi, represents two little angels lifting the child to the Madonna, who is engaged in devout meditation. The characteristics of Sandro Botticelli's art are nowhere more delightfully revealed than in his Madonnas. Of the two charming circular specimens in the Uffizi, the "Magnificat" is the most representative of his early manner, while its companion piece holds the same rank for his later period. Both represent the Virgin crowned and adored by dreamy angels. See Botticelli, Alessandro.

Of Leonardo da Vinci's Madonnas but two probable specimens survive: "La Vierge aux rochers," and the "Madonna with Saint Anne," a very unusual, though charming representation, in which Saint Anne sits in the Virgin's lap. (For description of his other Madonnas see Vinci, Leonardo da.) Michelangelo twice painted the subject: an unfinished Madonna in the British Museum, and the "Madonna of Angelo Doni," in the Uffizi, remarkable for the novel action of Joseph passing the child to the Madonna over her shoulder, and for the manner in which the background is filled with nude youths. The best known examples of Andrea del Sarto's Madonnas are the "Madonna del sacco," a fresco over the portal of the cloister of the Annunciata (Florence), so called for the sack upon which Joseph leans, and the "Madonna dell' arpie," which derives its name from the harpies on the pedestal, upon which the Virgin leans. See Sarto, Andrea del.

In the Madonnas of the Umbrian school its dreamy sentiment and ecstatic piety are most strikingly revealed. There are good examples by Perugino in the Uffizi, in the Vienna Gallery and elsewhere; but the best known is the "Enthroned Madonna and Child," surrounded by the patron saints of Perugia, now in the Vatican. Of the Ferrarese work of the fourteenth century it is sufficient to mention the fine altarpiece by Franceso Cossa in the gallery of Bologna, and those of Lorenzo Costa in the Church of San Giovanni in Monte (Bologna) and in the Berlin Museum. The altarpiece of San Andrea by Dósso Dossi (sixteenth century), now in the Gallery of Ferrara, representing the "Madonna Enthroned," surrounded by saints, with John the Baptist at the foot of the throne, is one of the best works, both in color and treatment, of Italian art. At Bologna Francia produced a number of Madonnas, celebrated for their mild, reproachful expression, of which the best known are in the gallery there: a "Madonna Enthroned," and the "Virgin in a Rose-Garden," adoring the Child. The best known Madonnas of Mantegna are the grand altarpiece of San Zeno, Verona, the example in the National Gallery (London), and most of all, the "Madonna della vittoria" in the Louvre. (For description see Mantegna.) Among the Madonnas of Correggio one in the Uffizi, "La zingarella" (the Madonna as a gipsy), in the Naples Gallery, and the "Vierge au panier," in the National Gallery, represent domestic scenes; more ambitious attempts are the "Madonna with Saint Francis" (Dresden) and the famous "Giorno" (Day) in the Parma Gallery. See Correggio.

The Madonnas of the Venetian painters of the fifteenth century unite Paduan virility of execution with Venetian charm of color. Especially beautiful are those of Giovanni Bellini, numerous in the Venetian Academy, the Berlin Gallery, and the Brera (Milan). A good example is the "Madonna with a Pomegranate" (National Gallery, London), but perhaps the most remarkable is the altarpiece of San Giobbe (Venetian Academy), in which two angels are represented at the foot of the throne of the Virgin, who is surrounded by five saints. Only one of Giorgione's survives: the "Castelfranco Madonna," in the cathedral of that town. The head of the Virgin, who is seated upon a high throne, is of the purest and most pathetic beauty. On her right is San Liberale in full armor, an ideal of knighthood, and to the left is Saint Francis. Above a wall in the background may be seen a fair and sunny landscape. Among Titian's Madonnas there are well-known examples at Vienna (including the "Madonna with the Cherries"), at Dresden, in the Louvre, the Uffizi, and the Prado (Madrid). The most celebrated and grandest, however, is the Pesaro Madonna, in the Church of the Frari, Venice. See Titian.

The chief of all Madonna painters, the one who developed the subject to its fullest extent, was Raphael. In his early period he painted a dreamy and sentimental type, the highest development of the Umbrian ideal; in the middle or Florentine period he used the theme to portray the relation of mother and child, while in the Roman he combined with this motif the nobler concept of the Queen of Heaven. Of the large number ascribed to him over fifty merit consideration; but some of these are probably the work of contemporary painters, and we know that many, especially in the Roman period, were executed by his pupils. Of his earliest period there are two good examples at Berlin, after drawings by Pinturicchio, but the "Connestabile Madonna" (St. Petersburg) is incontestably the finest. The Virgin sits reading in a garden, the Child in her arms; the picture is almost miniature in size and delicate in finish.

An early work of the Florentine period—perhaps the best, and certainly the most popular example—is the "Madonna del Gran Duca" (Pitti Palace, Florence), so called because it was the favorite of the Grand Duke. The Virgin stands erect holding the Child, and is statuesque in character and well modeled. Similar in pose is the "Madonna Tempi" (Munich), while those known as the "Colonna" (at Berlin), "Orleans" (Duc d'Aumale), and "Panshanger" Madonnas (at Panshanger), represent the Virgin as seated. All of these have been much damaged by restoration. Another favorite type represents the Virgin as seated in a meadow landscape with the infant Christ and St. John, of which the best examples are the "Madonna in the Meadow" (Vienna); the "Madonna del cardellino" (Uffizi), so called because John presents a goldfinch to the Virgin; and most perfect of all, "La belle jardinière," in the Louvre. (See Raphael.) Of his more ambitious altarpieces the chief are the "Blenheim" or "Ansidei Madonna" (1505, National Gallery, London), one of the best preserved of Raphael's works, in which the enthroned Virgin is represented between Saint John and Saint Nicholas of Bart; and especially the "Madonna del baldachino." See Raphael.

The best known Madonnas of Raphael's Roman period are the "Aldobrandini (Garvagh) Madonna" (National Gallery); the "Madonna col divin amore" (Naples); the "Madonna with the Diadem" (Louvre), in which the crowned Virgin lifts a veil from the body of the sleeping Child, revealing him to the enthusiastic Baptist.

Of the circular type the best known are the "Madonna della candelabra" (National Gallery), executed by a pupil; the beautiful "Madonna Alba" (St. Petersburg), and, chief of all, the "Madonna della sedia" or "seggiola," vying with the Sistine in popularity. (See RAPHAEL.) He also found time to paint three large altarpieces, the "Madonna di Foligno" (Vatican), in which the Virgin is enthroned in the clouds, with saints and the donor below, while the background is filled with the representation of Foligno struck by a thunderbolt. Another famous example is the "Madonna del pesce" (Madrid), so called from the fish which Tobias, escorted by the Angel, presents to the Madonna. But grandest of all, the culmination of Raphael's Madonnas, and the most perfect representation of the Queen of Heaven in art, is the Sistine Madonna. See RAPHAEL.

Many of Raphael's Madonnas during this period were only designed by him and executed by his pupils, especially by Giulio Romano; as, for example, the "Madonna del impannata" (window-pane), in the Pitti Palace, the "Madonna del passeggio," in Bridgewater House (London), and the "Madonna della gatta" (cat), in the Museum of Naples. Besides the works executed after the designs of Raphael, Giulio Romano designed Madonnas of his own, the best known of which, the "Madonna della catina" (Dresden), is so called because of the basin in which the Christ-child is being bathed. In general, the Madonnas of the Mannerist and Electic schools are of little interest, on account of the lack of real depth of feeling.

In Northern Europe fewer examples of "Madonnas" survive, owing in part to the Iconoclastic storms which devastated the churches. Though realistic in type, those of the Early Flemish and German schools do not endeavor to represent the subject as a mere family scene, but retain much of the mediæval dignity. Among the best examples by Jan van Eyck are the "Madonna of the Canon van der Poel" (Bruges); the "Virgin in a Gothic Chapel"—reputed part of a traveling altar of Charles V., at Dresden; the "Lucca Madonna," suckling her Child (Frankfort), and the famous "Madonna" of Chancellor Rollin (Louvre).

Stephan Lochner's "Virgin in the Arbor of Roses" (Cologne Museum) is a gem among the works of the early German school, soft and idyllic in character, while the same subject by Schongauer, in the church of Saint Martin, Colmar, is more solemn and grandiose. Dürer's "Madonna with the Pear" (Imperial Gallery, Vienna) is his chief representation of the subject. First in rank among all German Madonnas, as the Sistine among Italian, is the "Madonna of Burgomaster Meyer" at Darmstadt. (For description and illustration see HOLBEIN.) The great Dutchmen of the seventeenth century were little concerned with Madonnas, the Flemings somewhat more so. The best example by Rubens is the beautiful "Madonna of the Innocents" (Louvre), in which she is portrayed as surrounded by crowds of innocent children; while in Van Dyke's "Madonna of the Rosary" (Compania del Rosario, Palermo), cherubim and saints surround the Virgin, holding the rosary to Saint Dominic.

Among Spanish painters Murillo's Madonnas are of rare coloristic charm and deep religious feeling. Perhaps the finest examples, representing only the Virgin and Child, are in the Pitti (Florence) and Corsini (Rome) palaces, while in the grand example of the Louvre Saint Elizabeth and John are also represented. Madonnas in contemporary art are of less interest, because they are no longer the highest expression of the religious spirit of the day. Prominent among German examples are those by Overbeck (New Pinakothek, Munich), a reflection of the old Umbrian type; of Bodenhausen, Defregger, and Max (Leipzig Museum). The best known among the French are Bouguereau's "Madonna of the Angels" and "La Vierge consolatrice" (Paris, Luxembourg), and Dagnan-Bouveret's "Virgin in the Carpenter Shop."

Although the subject was often carved in stone, especially during the Gothic period, when it might be seen upon wellnigh every cathedral portal, these representations are not sufficiently important to require especial mention in this brief enumeration. A celebrated example is Andrea Pisano's relief over the side portal of Florence Cathedral. The exquisite terra-cotta reliefs of Luca della Robbia (see illustration) and his followers, of which there are numerous examples in the Museo Nationale and elsewhere in Florence, often represented the Madonna. The most celebrated example of a sculptured Madonna is Michelangelo's "Madonna of Bruges," in the cathedral of that city—a beautiful example of his early or realistic period. See MICHELANGELO.

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MADOQUA, mä'dô-kwȧ. The native name for a species of antelope in Abyssinia. See DUIKER.

MA'DOR, SIR. A Scottish knight who accused Queen Guinevere of poisoning his brother. Her part was espoused by Lancelot of the Lake, who slew Mador in a combat, and received as a reward the castle thereafter known as the Ioyeuse Garde.

MADOU, mȧ'dōō', JEAN BAPTISTE (1796-1877). A Belgian artist, born in Brussels, and early distinguished for his talent in depicting picturesque phases of life. He became professor of the royal school of Brussels and member of the academy of Antwerp. In 1821 he published a superior lithographic work entitled *Voyage pittoresque dans les Pays-Bas*, which was followed by works on the ancient and modern costumes of the Low Countries, and scenes in the lives of the Flemish and Dutch painters. His latest work was the valuable *Physionomie de la société en Europe, de Louis XI. à nos jours.*

MADOZ, mä′dôth, Pascual (1806-70). A Spanish statesman and author, born at Pamplona and educated at Saragossa. After a residence in France, he began the practice of law at Barcelona, and edited the *Diccionario geográfico universal* (1829-34), and a *Colección de causas célebres* (1840). He became prominent in politics, was appointed a judge, and was elected a member of the Cortes. There he opposed Espartero, and ultimately became the leader of the Progressist Party. In 1854 he was Governor of Barcelona, in 1855 was Minister of Finance, and in 1856, because of his liberal views, was obliged to leave Spain. Returning, he was active in the Revolution of 1868, was Governor of the Province of Madrid, and was a member of the Cortes. He died while accompanying the Spanish deputation to Rome to offer the crown of Spain to Amadeus. His important *Diccionario geográfico estadístico y histórico de España* was published in 1848-50.

MAD PARLIAMENT OF OXFORD. The name given by the adherents of Henry III. to the Parliament which assembled June 11, 1258, at Oxford. In the attempt to obtain for his second son, Edmund, the throne of Manfred (q.v.), King of Naples, Henry III. had become heavily indebted to the Papacy. The barons, however, refused to grant the necessary money without a redress of grievances, and the King was compelled to give his consent for the appointment of a committee of 24, chosen half from the Royal Council and half from the barons. The latter the Mad Parliament elected, and the whole 24 then drew up the Provisions of Oxford (q.v.). Consult Stubbs, *Constitutional History*, vol. ii. (4th ed., Oxford, 1896). See Montfort, Simon de.

MADRAS′. A province of British India, formerly the Presidency of Madras (Map: India, C 6). It occupies, together with its tributary States, the southern part of the Indian Peninsula, being irregularly bounded on the north by Bengal and the Central Provinces, and on the northwest by Bombay, Mysore, and Hyderabad. The province under direct British administration is divided into 22 districts, with a total area of 141,726 square miles; population, in 1891, 35,630,440; in 1901, 38,209,436. The native States of Travancore, Cochin, Padukota, Karnul, and Bellary, politically controlled by Great Britain, cover an area of 9969 square miles; population, in 1891, 3,700,622; in 1901, 4,188,086. The surface consists of a high plateau land encircled by mountain ranges, the Eastern Ghats extending in a southwestern direction until they merge in the Nilgiris, which are connected with the Western Ghats (qq.v.). A long and broad plain lies between the Eastern Ghats and the shores of the Bay of Bengal, generally known as the Coromandel coast (q.v.), and a narrow plain interspersed with lagoons extends between the Western Ghats and the Malabar coast (q.v.) on the Arabian Sea. The principal rivers, the Godavery, Kistna, and Kavery, all rise in the Western Ghats, and traversing the plateau break through the Eastern Ghats and flow into the Bay of Bengal. The soil of the plateau generally is fertile and productive under irrigation; the coast lands are sandy and, except in the deltaic regions, sterile. The climate varies according to elevation; on the whole it is sultry but fairly healthful. While on the west coast the rainfall is usually excessive, in the interior it is generally inadequate and its failure has been the cause of occasional famines; extensive irrigation works have been constructed in the attempt to modify this evil. Forests of teak, sandalwood, eucalyptus, ebony, and rosewood, under reservation rules, cover about 18 per cent. of the surface. The chief wild animals are the elephant, gayal (a species of cattle), black leopard, and ibex. The principal minerals are iron, coal, copper, lead, antimony, and silver, while gold, garnets, and diamonds are found in paying quantities, and salt is largely manufactured on the coasts by evaporation.

Agriculture. Most of the inhabitants obtain a living from the cultivation of the soil. Unfortunately, as already mentioned, the rainfall is so uncertain that only on the western or Malabar coast is it always adequate to the requirements of the growing crops. The uncertainty of the other portions is in a large measure obviated through the extensive practice of irrigation. This is especially true of the deltaic coast region north and south of the city of Madras, where the Government has constructed enormous canals and distributory systems which afford a water supply for vast areas. Considerable areas in the more elevated interior regions have also been brought under irrigation through the construction of numerous reservoirs and the digging of a multitude of wells by both public and private enterprise. Of a total area of 23,122,000 acres returned in 1900, as being actually cropped during the year, 5,783,000 acres were irrigated. Almost the whole of the irrigated land is given up to the cultivation of rice, the acreage for which in 1900 was 6,429,000. The great staple dry land crop is millet—8,530,000 acres—though large quantities of other food grains and pulse are raised. Over a million and a half acres of oil seeds were grown and a somewhat less amount of cotton. Cattle and buffaloes take the place of horses as beasts of burden, and in 1900 numbered respectively 8,264,000 and 2,406,000. There were also 13,415,000 sheep and goats.

Other Industries, Commerce, etc. The native cotton manufacturing industry, which was widely developed in former years, has greatly diminished under foreign competition. Only 13,000 operatives were engaged in the eleven cotton mills operating in 1897. In 1899 but 73 establishments were reported, with 32,300 hands employed. The manufacture of cigars has acquired some importance. In a few places ivory-carving has become important, and the old occupation of metal-working still has a considerable following. Salt is extensively produced along the east coast, but under a Government monopoly. Some indigo is manufactured. The trade of the province suffers from the want of adequate harbor facilities on the east coast. Much of the trade is by rail to Bombay and other large trading centres. The foreign trade about doubled in the last two decades of the nineteenth century. Hides, coffee, rice, and indigo are the leading exports, and manufactured cotton goods, railway materials, and wrought metals are the leading imports. In 1897-98, 78 per cent. of the import trade and 43 per cent. of the export trade was with the United Kingdom.

Inhabitants. Most of the inhabitants belong to the Telugu and Tamil branches of the Dravidian race, and profess some form of the Hindu religion. The Mohammedans number 2,250,000, the percentage of these being less than in the provinces to the north. Madras contains over one million Christians, or more than one-half of all the Christians in British India. Most of the people live in rural villages; Madras (q.v.), the capital and the third largest city of India, is the only place that attains any great magnitude. Its population in 1901 was 509,000.

EDUCATION. In 1896-97, 822,853 pupils attended the schools and educational institutions, which was over 15 per cent. of the children of school age, whereas the corresponding per cent. a decade earlier was only 10.6. Only about one-seventh of the total attendance were female. The public primary schools contained 617,886 pupils. English is taught throughout the public system.

GOVERNMENT. The Governor and administrative council of two members receive their appointment from the Crown and serve for five years. To these are added other members (not to exceed 20) to constitute a legislative council. The additional members are appointed by the Governor, but part of them are nominated by the Madras corporation or other official bodies. Each of the 22 districts into which the province is divided is administered by a collector and inferior officers. Unlike other provinces, the districts are not grouped into commissionerships. Local government is more highly developed than in the other provinces. There are district and subdistrict boards and village committees. In the fiscal year 1897-98 the Imperial net revenue amounted to 7,304,601 tens of rupees, the provincial to 2,811,486, and the local to 1,049,068, while the corresponding figures for expenditure were Rx. 3,371,870, Rx. 2,811,684, and Rx. 1,048,870. The most important source of receipts is the land revenue.

HISTORY. Anciently the province was divided into several kingdoms, of which the chief were Telingana on the northeast, Karnataka on the west, and the Tamil principalities of Pandya, Chola, and Chera in the south. Splendid architectural monuments, stone and brass inscriptions, and imaginative traditions attest their former existence. Authentic history begins with the Mohammedan invasion of the fourteenth century, when Ala ud-Din conquered the kingdoms of Karnataka and Telinga. After the Mohammedan evacuation the native dynasty of Vijaynagar dominated until 1565, when it was overthrown by the Deccan Mohammedans; later the country again became divided into principalities, of which the more prominent were the Carnatic, Mysore, and Tanjore. After the first visit of Vasco da Gama in 1498, Madras was one of the principal battle-grounds of the Portuguese, Dutch, French, and British in the struggle for supremacy.

MADRAS′. A seaport city, capital of the Province of Madras, British India, situated on the Coromandel coast of the western shore of the Bay of Bengal, 835 miles southwest of Calcutta, and 640 miles southeast of Bombay; latitude 13° 5′ N., longitude 80° 16′ E. (Map: India, D 6). It is the third city in size and importance of India, and has railroad and telegraphic communications by the main systems with the principal towns of the Empire, but although much has been done to improve its harbor facilities, it is no longer a port of call for the principal European lines of ocean steamers, owing to the insecurity of its harbor. The city and its nine suburbs cover an area of 29 square miles, extending along the coast for nine miles and inland for nearly four. Centrally situated on the shore is Fort Saint George, strongly fortified and garrisoned by European and native troops and containing the council house, civil and military offices, and Saint Mary's, the oldest English church in India, dating from 1678. Adjoining the fort on the north is the commercial district of Black Town, a low-lying, poorly built, and densely populated quarter, covering an area of a square mile, protected from inundation by a strong sea wall. Here are situated the mercantile establishments, the Bank of Madras, the Post Office, and the old High Court, now occupied by the customs offices, its tower with a modern installation serving as the lighthouse for the harbor which extends along the larger portion of the water front of Black Town. To the south and rear of the fort is the island, formed by the encircling Cooum River, containing barracks and forming an extensive military parade and recreation ground. It connects by bridges on the north with the People's Park, and on the west and south with the residential sections, where are situated the handsome Government House, the clubs, marine parade, the Chepauk Park and buildings, the Scotch Church of Saint Andrew, the fine university buildings, and the native hospital. On the Mount Road, commanding a magnificent view of the city and its vicinity, is Saint George's Cathedral, containing several beautiful monuments by Chantry and Flaxman. Other noteworthy features are the New Law Court buildings in a Hindu-Saracenic style of architecture, opened in 1892, the new Law College, the Christian College buildings, Pacheappah's College and hall, the memorial hall, the grand arsenal, with an interesting military museum, the observatory founded in 1792, which gives standard time to all India, and several native mosques and temples. The southernmost extension of Madras is the old Portuguese town of Saint Thomé, near the Adyar River, with the ancient Roman Catholic Cathedral of Saint Thomé, said to contain the remains of Saint Thomas. There are several charitable and benevolent institutions, and Madras is noted for its educational establishments, which include the university, founded in 1857, colleges of agriculture, of engineering, medicine and law, a teachers' college, six missionary colleges, Victoria Technical Institute, a Government school of arts, a valuable museum, libraries, zoölogical and botanical gardens, and literary and scientific institutions.

The city's affairs are administered under a charter of 1884, by 32 commissioners, eight, including a salaried president, being appointed by the provincial authorities and twenty-four being elected by the ratepayers. Madras has undergone much modern improvement; it has a good reservoir water supply, conveyed from a distance of seven miles, and a sewage farm disposal system, and is lighted by gas and electricity. Harbor works, commenced in 1875, were constructed after much difficulty, and consist of two breakwaters, respectively 3907 and 3726 feet long, inclosing a large water area fronting Black Town. Passengers are now enabled to land in comfort without the former perils attendant on a passage through the notorious Madras surf, but during the cyclones of the monsoon periods the harbor is unsafe for large ships, which seek the open sea on receipt of meteorological warnings; numerous wrecks, many of historic interest, have occurred in the Madras roadstead. In 1897-98, 711 vessels entered and cleared a total tonnage of 1,158,897, valued at 129,885,783 rupees, of which 105,017,710 represented foreign trade, and the balance the coastwise trade. The chief exports are cotton, rice, coffee, hides, and skins. Local traffic is facilitated by the Buckingham, Cochrane, and Cotton canals. Madras has some large cotton mills, but its industries are purely domestic and of no great magnitude. The United States is represented by a consular agent. The mean annual temperature is 82°; during the hot months the thermometer frequently registers 96° in the shade, but the heat is pleasantly tempered by 'the doctor,' a sea breeze so named by the residents, which sets in at noon and lasts till night. The seasons are distinctly marked by the monsoons, the northeast lasting from October to February and the southwest from May to October.

The Portuguese founded Saint Thomé in 1504, but Madras dates from a grant of land made by the Raja of Chandragi to a British subject in 1639, and the construction of a fortified factory. The Presidency of Madras was established in 1653. By 1743 Madras had developed into the largest city of Southern India; in 1746 it was captured by the French, but was restored two years later under the Treaty of Aix-la-Chapelle. In 1749 Saint Thomé was annexed by the English. Madras was again besieged, but unsuccessfully, by the French in 1758. Population, in 1891, 452,518; in 1901, 509,397, of which 79 per cent. were Hindus, 12 per cent. Mohammedans, and 9 per cent. Christians.

MADRA'SAH (Ar., school, from *darasa*, to study). The name given by Mohammedans to their colleges or institutions of higher education. In the first centuries of the Hegira there were no separate buildings for educational purposes; elementary and advanced instruction were both given in the mosques themselves or in annexes, and were largely of a desultory and voluntary character. In the eleventh century Nizan-el-Molk, under the Sultan Alp Arslan, is said to have founded the first college or *madrasah*, and the custom spread rapidly to every part of the Mohammedan world. Each of the four orthodox sects established colleges in the principal cities for the teaching of its tenets. Those of Bagdad at once became famous, and, soon after, those of Cairo (under Saladin), of Damascus (where over thirty existed), of Cordova, Seville, Malaga, and Granada in Spain, and of many cities in North Africa (Fez, Kufa, etc.), Turkestan, and Persia (Ispahan, Shiraz). Later, there are said to have been as many as five hundred colleges in Constantinople.

Sometimes these colleges were of a general character, teaching the doctrines of all four orthodox sects, as regards theology and jurisprudence, with the related or propædeutic subjects of grammar, exegesis of the Koran, traditions, rhetoric, logic, ethics, as well as such subjects as pure literature, medicine, mathematics, physics, and philosophy. There was a regular staff attached to each, divided ordinarily into three classes: the *cadi* or judge, the *mudarris* or professor, and the *katib* or reader. They received a salary from the endowment of the college, which was administered by a body of trustees; such property was called *wakf.* A certain number of regular students were also supported from this endowment, both teachers and students living in the college buildings. Beside a large lecture hall and several smaller ones, a hospital and operating rooms, a library, dormitories, kitchen and refectory, there were large and small special buildings, particularly mausoleums and a mosque for religious devotions. Sometimes there were observatories and botanical gardens.

Hardly any large Mohammedan city is without several such madrasah groups of buildings, usually of the late mediæval period. For the study of architecture they are almost as important as the mosques (q.v.). In fact, they usually include both mosques and minarets and sometimes the mosque forms the centre and key of the group of buildings. The magnificent so-called mosque of Sultan Hasan at Cairo (fourteenth century) is really a college with a mosque attached to it; so is that of Kalaûn. Others at Cairo are those of Khawand-el-Baraka, of Kaït Bey, of Sultans Barkuk and Muayyed. If in these and many other cases the buildings of the college proper are subordinate to the mosque, there are others where it is not so. The *madrasah* of Sultan Hussein at Ispahan, built around an immense court, with a double gallery of arcades, is especially magnificent.

MADRAS SYSTEM. See MONITORIAL SYSTEM.

MADRAZO, mȧ-drä'thô, FEDERICO DE (1815-94). A Spanish painter, son of José de Madrazo, born in Rome. He studied with his father and under Winterhalter in Paris, then returned to Spain, and in 1859 became professor in the Academy of Madrid. With his brother-in-law, Ochoa, he founded *El Artista* (1835). Madrazo's most typical canvases are the able and numerous portraits of Spanish nobles, especially of Queen Isabella, of Angel Saavedra, and of Campoamor. In historical painting as well he imitated Murillo's coloring and produced such pictures as "Godfrey de Bouillon Crowned King of Jerusalem," "Women at the Sepulchre of Jesus," "The Burial of Cecilia in the Catacombs," and "Maria Christina at the Bedside of Ferdinand VII." Among his later works were some excellent genre pictures, the chief being "The New Song," "The Cigarette," and "The Musical Matinée."

MADRAZO, mȧ-drä'thô, RAIMUNDO DE (1841 —). A Spanish painter, born in Rome. He was the son and pupil of Federico de Madrazo, and afterwards studied under Cogniet. He received a first-class medal at the Paris Exposition of 1878 for "The End of a Masked Ball," a typical work, brilliant in execution and color. Other pictures by him are: "Fête During Carnival," "El Jaleo," "Pierrette" (1878); "The Soubrette" (1882); and "The Domino" (1883). His portraits in oil and pastel show the same admirable technique.

MADRE DE DIOS, mä'drâ dâ dyôs (native name *Amaru-Mayu*). The principal tributary of the Beni River (q.v.) in South America. It rises in the Carabaya Range in the southeastern part of Peru, about 50 miles east of Cuzco. Thence it flows eastward for 900 miles through the almost unknown forest regions of La Montaña, crossing the northwestern part of Bolivia. At Rivera Alta it enters the Beni, about 150 miles from its confluence with the Mamoré. It was long an object of geographical conjectures, only its upper course being known until 1865, when it was explored by a party sent out by the London Geographical Society. It is a magnificent stream, over 500 yards wide at the Bolivian frontier, and 1500 yards wide at its confluence with the Beni. It is as yet little used, but since 1881 the exploitation of rubber along its shores has been carried on.

MAD′REGAL. A West Indian name for one or two of the lesser species of amber-fish (q.v.), as *Seriola fasciata* and *Seriola falcata.*

MAD′REPORE (from It. *madrepora,* mother-of-pearl, probably from *madre,* from Lat. *mater,* mother + Gk. *πόρος, poros,* passage, pore, or *πῶρος, pōros,* light friable stone). A large branching coral abounding on the reefs of Florida and other parts of the tropics in the Atlantic, Pacific, and Indian oceans. The most abundant species in the West Indies is *Madrepora cervicornis,* so called from its habit of growing in bush-like masses nearly two feet high and three to four feet in diameter, the separate spikes or branches resembling the antlers of a deer. It is the most abundant of the true reef-building corals. It grows up to the level of the sea, and then, becoming exposed at low water, the tips of the branches are often killed. It easily breaks when exposed to the waves, as it usually is, and its fragments form a large proportion of the coral sand, which becomes solidified into coral rock. See CORAL, and accompanying Plates.

The madrepore is the most complex of all the corals. Its tree-like form is due to multiplication of the small corallites by budding. A corallite is the individual polyp of the colony supported by its coral stock or skeleton. It is a perforate type of corals, all parts of the coral stock and connecting cœnenchyme (formed by the calcification of the cœnosarc or inner layer of the polyp) being like a mesh-work consisting of calcareous fibres arranged like basket-work, and traversed by a net-work of tubes, representing the cœnosarc and communicating with the other polyps of the colony. The madrepores do not live in water the winter temperature of which is under 60° F. They abound on the Bermuda Islands in the Atlantic, and as far north as Southern Japan in the Pacific Ocean, while their southernmost limits are Rio Janeiro and Saint Helena in the Atlantic, and Queensland and Easter Island in the Pacific Ocean. Thus they extend to about north and south latitude 30°.

Consult authorities cited under CORAL, and particularly Saville Kent, *The Great Barrier Reef of Australia* (London, 1893), containing many illustrations from photographs of these and other reef corals.

MADRID′, *Sp. pron.* mȧ-drēd′. The capital of Spain and of the Province of Madrid in New Castile. It is situated in latitude 40° 24′ N., and longitude 3° 41′ W., nearly in the centre of the Kingdom, on a plateau 2100 feet above the sea, and on the left bank of the Manzanares, a small affluent of the Jarama, which latter flows into the Tagus (Map: Spain, D 2). The situation is unfavorable from almost every point of view. The surrounding plateau is treeless and bare, and almost uninhabited, and the city is exposed alike to the scorching south winds and the fierce rays of the sun in summer and to the icy north winds from the snowclad Sierra Guadarrama in winter; the extreme annual range of temperature sometimes reaches 100°. The clearness and dryness of the atmosphere, however, and the extensive plantations which have in the last half century grown up in the suburbs make the climatic conditions less unbearable.

The old city has the form of an oval contracted at the middle, and was surrounded by a wall which was razed in 1878, thus bringing the suburbs into the greater modern city, which is well provided with plazas, parks, and promenades. In the centre of the old city is the plaza called La Puerta del Sol, from the gate which stood there in mediæval times. This is the business centre and the terminus of all the street railways, and around it are the most prominent hotels and commercial houses. In its centre are a monumental fountain and a statue of Philip II. From here the principal streets of the city radiate in all directions. Westward run the Calle del Arenal and Calle Mayor, both leading into the large open place where is the Royal Palace, and which in the north, in front of the palace, is laid out in the plantation called Plaza de Oriente. There is the magnificent equestrian statue of Philip IV. Further west, between the palace and the river, are the royal gardens, or Campo del Moro, and from this the Puente de Segovia and the Puente del Rey lead across the river into the large royal park of Casa de Campo. Eastward from the Puerta del Sol run the Calle de Alcalá and the Carrera de San Jerónimo into the broad and magnificent boulevard which runs north and south the entire length of the city and between it and the eastern suburbs. This is one of the finest promenades in the world, is shaded by four to six rows of trees, and ornamented by a number of fountains, statues and other monuments, among which are an obelisk, and an equestrian statue of Queen Isabella. The names of the boulevard, beginning at the south, are the Paseo del Trado, Salón del Prado, Paseo de Recoletos, and Paseo de la Castellana, and it terminates in the north at the Hippodrome. East of the Paseo are the Jardin del Buen Retiro, the Botanical Gardens, and the immense Parque de Madrid, beautifully laid out with lakes and parterres, and ornamented with fountains and statues. Among other public monuments should be mentioned some of the old city gates which have been left standing as triumphal arches. The chief among these is the Puerta de Alcalá in the Plaza de la Independencia, an expansion of the Calle de Alcalá east of the Paseo. It was erected in 1778 in honor of Charles III., and is an imposing structure pierced by five gateways, the three in the middle being arched.

Madrid is distinctly of modern date, and it has none of the old architectural monuments boasted of by other Spanish cities. Foremost among the buildings stands the Royal Palace, on the site formerly occupied by a Moorish castle, which was renovated and used as a residence by Emperor Charles V. and the monarchs of the Hapsburg dynasty. The modern palace was planned by Philip V., begun in 1738 and occupied in 1764. It is an imposing granite structure, built on a square plan with sides 470 feet long inclosing an inner court, while two projecting wings to the south inclose the Plaza de Armas. The uneven site is leveled by huge substructures of solid masonry. Above these are three basement stories, the fourth or principal floor being surrounded by a balustrade from which a series of Ionic and Doric columns reach to the roof. At the main entrance is a large *patio* containing statues of Roman Emperors. The interior halls and salons are superbly decorated with frescoes, paintings, and statuary. Next to the palace, the finest building in the city is that of the National Library and Museum, situated on the Paseo de Recoletos. It is a new building, finished in 1892, and is regarded as one of the handsomest of its kind in Europe. It is a large rectangular structure with a wide flight of marble steps leading from the Paseo to the main entrance; in the interior is a large reading room 90 feet square and 60 feet high. Among other secular buildings might be mentioned the City Hall, and the buildings devoted to the departments of the Government, especially that of the Ministry of War, which occupies the vast palace formerly the residence of the Dukes of Alba, and the large and handsome building near the Retiro Park, occupied by the Ministries of Public Works, Agriculture, Industries, and Education. The two Houses of the Legislature meet in separate buildings, the Senate occupying an old Augustinian convent which has been restored. The Bank of Spain and the Royal Exchange occupy new and monumental buildings. The most notable of the churches is probably that of San Francisco el Grande, built in the eighteenth century, and recently subjected to an extensive restoration. Its main body is circular, surmounted by a grand cupola, and with two lateral towers.

Foremost among the educational institutions of Madrid is the university, with over 5000 students. (See MADRID, UNIVERSITY OF.) There are also a normal school, a veterinary school, schools of commerce, engineering, architecture, music and fine arts, and the astronomical observatory, an elegant and well equipped building situated in the Parque de Madrid. Between the Parque and the Prado is the Botanical Garden, containing an immense wealth of flora as well as large herbaria and other collections. Madrid is rich in libraries and museums. The National Library, in a large new building, contains about 600,000 volumes, about 30,000 manuscripts, a collection of 100,000 engravings and drawings, a fine archæological collection, and a museum of natural history. The library of the university contains over 200,000 volumes, and the Marine Library has 30,000 volumes. The National Museum of Painting and Sculpture, occupying a fine large building on the Prado, has a collection of masterpieces rivaling those of the Louvre. Raphael, Titian, Rubens, etc., are well represented, and above all the painters of the Spanish School, Velazquez being here seen at his best. Another famous museum of Madrid is the Royal Armory, containing the richest and finest collection of arms in existence. Besides these are a number of minor museums. Madrid is the seat of various scientific and literary societies, chief among which are the Spanish Academy, similar in scope and purpose to the Académie Française, and the Historical, Anthropological, and Geographical societies.

Madrid has a score of theatres; the most prominent are the Teatro Real, facing the Royal Palace; the Teatro de Apolo, and the Teatro de la Comedia, which is one of the most popular. The Plaza de Toros, or bull ring, is a magnificent structure built in pure Moorish style and seating over 13,000 spectators. There are also a number of large and well equipped hospitals and asylums, and a fine new model prison. The public works of the city are in general well developed, especially the electric street railways and gas and electric light; there is also a good system of street cleaning. The water supply, however, which was formerly noted for its abundance and purity, has not kept pace with the population, though a new reservoir was finished in 1883 and a third is now nearing completion. The supply from the sources in Lozoya River is wholly inadequate, and in 1899 it almost gave out.

Industrially Madrid is not very active. Owing to the unfavorable situation, the cost of living is very high, and it is only the fact of its being the capital, with the numerous train of officials, courtiers, and office-seekers, that supports the large population and makes it a lively and bustling town. Among its factories the principal is the large national tobacco factory. There are also some manufactures of jewelry, leather articles, fans, umbrellas, musical instruments, chemicals, soaps, and perfumes. The commerce of the town is more active. It is the general railroad centre for the entire country, as well as the principal store-house for the inland provinces. There are two large and a number of smaller markets, several prominent banks and commercial and insurance companies, an exchange, and a chamber of commerce. The population of Madrid has trebled within the last century, as may be seen from the following figures: 1787, 157,000; 1887, 470,000; 1900, 540,109.

Nothing is known of Madrid previous to the Saracen occupation. In the tenth century it appears as a small fortified outpost under the name of Majerit (Majoritum). It was taken from the Moors by Alfonso VI. in 1083, but was recaptured in 1109 and held for a short time by the Almoravides. The Cortes met in Madrid for the first time in 1329, but it was not until 1561 that the city was made the permanent capital of Spain by Philip II. On May 2, 1808, the citizens of Madrid gave the signal for the War of Independence, by rising in revolt against the French general, Murat. Several hundreds of the patriots were killed in a battle on the Prado, where a monument now commemorates them. For this brave attempt the city received the title of *Muy Heróica Villa*. Curiously enough, though it is the largest town in the Kingdom, it has never received the title of *ciudad*, or city. On January 14, 1526, a treaty was concluded at Madrid between Charles V. and Francis I., who was then a prisoner in the hands of his rival. Francis, having secured his liberty, violated the terms of the treaty and renewed the struggle with Charles.

Consult: Valverde y Alvarez, *La capital de España* (Madrid, 1883); Amador de los Rios, *Historia de la villa y corte de Madrid* (Madrid, 1861-64).

MADRID, UNIVERSITY OF. A Spanish university which originated in the foundation of the College of Doña Maria of Aragon by Alonzo Orozco in 1590, perhaps on an older foundation of 1508. The Hapsburg kings set up schools for mathematics and science in the Alcázar in the sixteenth and seventeenth centuries, and in 1786 the College of San Carlos was opened in Madrid for the study of medicine and surgery. After many plans to move the university of Alcalá to Madrid, the transfer was finally accomplished in 1836-37, and from this removal the foundation of the University of Madrid may be said to date. It is now one of the largest of European universities, and the leading institution of Spain. United with it is the great preparatory school of San Isidorio, founded by Philip IV., and reconstituted by Charles III. in 1770. The University of Madrid has a budget of over 900,000 pesetas, and it has an attendance of over 5000 students, the great majority of whom are in the faculties of law and medicine. The library has over 200,000 volumes and about 5500 manuscripts. The University of Madrid includes museums, clinics, collections, and an observatory.

MADRIGAL (Fr. *madrigal*, from It. *madrigale*, OIt. *madriale*, *mandriale*, ditty, from It., Lat. *mandra*, from Gk. *μάνδρα*, flock). A short lyrical poem, adapted to the quaint and terse expression of some pleasant thought, generally on the subject of Love. Though somewhat varied in form, it usually consists of from six to thirteen short iambic lines constructed upon three rhymes. Among the Italians the best writers of madrigals are Petrarch and Tasso; among the French, Montreuil, Lainez, and Moncrif; among the Germans, Hagedorn, Voss, Goethe, and Schlegel; and among the English, Lodge, Withers, Carew, and Suckling. The name madrigal is also applied to a form of vocal composition, which during the sixteenth century occupied a position very similar to that of the *Kunstlied* (art song) of to-day. It was set generally for five voices, but madrigals for three, four, and six voices are also found. The texts were generally of an erotic character. The madrigal differed from the more popular frottola (q.v.) and villanella (q.v.) in its elaborate contrapuntal workmanship. The form of the madrigal was probably originated by the troubadours of Provence. Dante's friend Casella is reputed to have been the first notable composer of this form in Italy, where it soon became very popular. But the real father of the madrigal is Adrian Willaert (1480-1562), who was born in Flanders, but went to Italy and there developed this form from the then existing frottola. As perfected by this master the madrigal soon found its way beyond Italy. In 1538 Arcadelt published a book of madrigals, in the identical form already established by Willaert, and it created a great sensation. Indirectly the madrigal helped to develop the opera, for after the establishment of the 'monodic style' popular madrigals were arranged for a solo voice with accompaniment of the lute or some other instrument. In this way the madrigal became an important factor in the propagation of the new monody. The precursor of the Florentine *dramma per musica* (see MONODY) was in fact nothing else than a succession of monodic melodies loosely strung together. After the establishment of monody, madrigals gradually fell into disuse. Madrigals were introduced early into England, but the first English collection, *Musica Transalpina*, edited by N. Yonge (1588), was made up mainly from translations of the Italian. Previously, however, in 1530, a collection of polyphonic songs had been published by Wynkyn de Worde. There are now extant more than a thousand madrigals composed by about a hundred different musicians of the seventeenth century. Among the most distinguished English composers in this form are William Byrd (the earliest), John Wilbye, John Dowland, Thomas Morley, and Orlando Gibbons. In 1741 the Madrigal Society (q.v.) of London was founded. In the eighteenth century the madrigal was superseded by the *glee*, which differs from the former in that it is performed by solo voices, whereas the madrigal was always performed by a chorus. Consult Cox, *English Madrigals in the Time of Shakespeare* (London, 1899).

MADRIGAL SOCIETY. The oldest musical association for part singing in Europe. It was founded at London in 1741 by John Immyns, a member of the Academy of Ancient Music. The earliest records date from 1744, and the following year we find the number of members limited to 16, and the meetings taking place every Wednesday evening. The sessions were divided into two parts, in each of which four madrigals were sung. Later the number of members was increased to twenty, then thirty, and finally to forty, the present number. In 1811 the first prize, a silver cup, was offered for the best madrigal by a member of the society, and in 1876 ladies were first admitted to the yearly festival. There are at present five meetings a year.

MADROÑA, mȧ-drō̆′nyȧ. A Californian tree. See ARBUTUS.

MAD TOM. Any of several small catfish of the genus Schilbeodes, common throughout the fresh waters of the Eastern United States, especially southward. They have elongate bodies and very thick skins, and have habits similar to those of darters, "lying on the bottom among rocks and weeds and delighting in small, rocky brooks." The best-known species is *Schilbeodes insignis*, which reaches a length of nearly a foot; it is dark brown, somewhat mottled, and all the fins are broadly dark-edged. Another much mottled form is *Schilbeodes miurus*. These catfish have large poison glands, and a wound from the pectoral spine is painful, though not serious. See CATFISH and Plate of CATFISH.

MADURA, mȧ-dōō′rȧ. The capital of a district in Madras, British India, the ancient capital of the Pandyan Kingdom, 270 miles (344 by rail) southwest of Madras (Map: India, C 7). It is celebrated for some of the finest examples of Hindu architecture in existence. It has wide and regular streets, and large market places, and until recently was surrounded by a double wall with 72 towers and an encircling ditch from 60 to 70 feet wide; the dwelling houses, however, are poor. The Temple of Minarchi or Fish Mother, in the centre of the city, is the fourth of the seven strongholds of idolatry in India. It is said to have been partially destroyed in the flood of Menu, and to have been rebuilt by Sekhara Pandyan in the second or third century; to have been nearly destroyed during the second Mohammedan conquest in the fourteenth century, and renewed by Viswanatha Nayak. Its present splendor is due to Tirumulla Nayak, the last Rajah, who reigned 1622-62. The outer wall of the temple is a parallelogram of 800 by 700 feet, within which are 50 buildings devoted to the various purposes of the temple worship, and the use of those who conduct it. The wall is of granite with a parapet of brick, and is 37 feet high. The main entrances are by four gateways, 30 feet high, through towers 50 or 60 feet wide at the base which rise in 11 stories to the height of 150 feet. One choltry or rest-house within the inclosure, built by Tirumulla Nayak, is 312 feet by 125, the roof supported by 162 columns, many of them wrought from a single stone. Fifty-four of these columns are 30 feet high, of two stones fitted face to face so as to look like one solid block 4½ feet thick, carved on all sides with life-size figures in full relief or in bas-relief. The granite roof in the Sahasrastambha Mandapam, or Hall of One Thousand Pillars, is supported in reality by 997 columns, and the columns in the whole temple number 10,000. A palace built by Tirumulla Nayak has been restored and is an edifice of considerable magnificence. Madura was the political and religious capital of Southern India from the earliest time. It is the Modura of Ptolemy, and in the time of Augustus its king sent ambassadors to Rome. Early in the Christian Era a college was founded here for the cultivation of Tamil literature, and was distinguished for the learning of its professors; the care taken to preserve the purity of the language is in evidence to this day. The last sovereign, Queen Menakshi Amman, was dethroned by Chunder Sahib in 1736; from 1740 to 1760 the city was repeatedly besieged. A Roman Catholic mission, established here early in the seventeenth century, flourished until the English occupation. In 1837 it was reëstablished and is a prosperous institution. The American Protestant mission established in 1834 has also accomplished much for the people, especially through hospital work. Two colleges and three schools receive State aid, and there are several literary institutes. Cotton and coffee mills and cigar factories are the chief industrial establishments, supplying a domestic trade. Population, in 1891, 87,428; in 1901, 105,501.

MADURA. An island of the Malay Archipelago, belonging to Holland, and separated by a narrow strait from the northeast coast of Java (Map: East Indies, D 6). Its area is 1699 square miles, and, including a number of small dependent islands, 2057 square miles; it is mountainous, with a not very fertile and poorly cultivated soil. Cattle-raising is the chief occupation of the inhabitants. The production of salt is an important industry, but is entirely in the hands of the Government; petroleum is also found. The island is administered by a Dutch resident, subject to the general Government of Java. The capital is Pamekasan, with a population (1895) of 7797, and the largest city is Sumenep (population, 18,425). The population of the island, with its minor dependencies, was in 1895 1,630,510, of whom 578 were Europeans, 4127 Chinese, 1657 other foreigners, and the rest natives professing Mohammedanism. The natives of Madura resemble closely the Javanese proper, with whom they are allied linguistically and somatically. The Madurese are stronger and more active than the Javanese.

MADVIG, mäd'vĭg, JOHAN NIKOLAI (1804-86). A Danish classical scholar, born at Svanike, in the island of Bornholm, August 7, 1804. He was educated at the University of Copenhagen, and obtained there the professorship of the Latin language and literature when he was only twenty-five years of age. Although his life was chiefly devoted to philological studies, and to the careful editing of classic works, he held very important official positions in Denmark, where he was Minister of Public Worship from 1848 to 1852, and Director of Public Instruction in 1852. He was repeatedly elected to the National Legislature, and was several times president of the Folkething. He published a *Glance at the Constitutions of Antiquity;* a *Latin Grammar for Schools* (translated into English by Thacher, Boston, 1888); *Adversaria Critica ad Scriptores Græcos et Latinos; The Creation, Development, and Life of Language;* and other works. Madvig exercised great influence by his writings upon both German and American scholarship. His last works were a dissertation on *The Constitution of the Roman State* (1882), and an Autobiography which appeared in 1887, the year following his death, which occurred December 12, 1886. See Nettleship, *Lectures and Essays, Second Series* (Oxford, 1895).

MAD WORLD, MY MASTERS, A. (1) A merry dialogue between two travelers by Nicholas Breton (1603). (2) A play by Middleton (1608), a vivacious comedy of a young scamp and an old grandfather. This was partly adapted by Mrs. Aphra Behn in her *City Heiress* (1682), and used by Charles Johnson in *Country Lasses* (1715).

MÆAN'DER (Lat., from Gk. *Μαίανδρος*, *Maiandros*, now called Menderes.) The ancient name of a river of Asia Minor, rising near Celænæ, in Phrygia, and flowing in a southwest direction into the Icarian Sea at Miletus. It was famous in classic times for its numerous windings, and thus gave its name to the well-known and beautiful patterns so common in Greek ornamentation. Its course is 240 miles, during which it receives many tributaries. It is a narrow and deep stream, but frequently overflows its banks, and by means of alluvial deposits has extended its channel considerably. It is navigable for small vessels only.

MÆCENAS, mê-sē'nȧs, GAIUS CILNIUS. A Roman statesman, celebrated for his patronage of letters. He was born between 73 and 63 before Christ. His family was of Etruscan origin and claimed royal descent. He received an excellent education, and was familiar with Greek and Roman literature. His first appearance in public life dates after the assassination of Julius Cæsar (B.C. 44), when he figures as the friend and adviser of Octavian. He had, it is clear, a talent for private diplomacy, and was employed mainly in that capacity. He 'arranged' a marriage between Octavian and Scribonia, made up (temporarily) the differences between Octavian and Antony, and brought about the peace of Brundisium. In B.C. 36 he was in Sicily, helping Octavian, as usual. Five years later, when the latter was fighting the decisive battle of Actium with his rival Antony and Cleopatra, Mæcenas proved himself a vigilant governor of Rome by crushing a conspiracy of the younger Lepidus, and thereby preventing a second civil war. When Octavian became Emperor under the title of Augustus (a step which he is said to have taken by the advice of Mæcenas, who was profoundly impressed with the necessity of a 'strong government' to repress the anarchic elements of the period), the latter was appointed administrator of all Italy. The nature and extent of his official power are not very precisely understood, but it was undoubtedly great, though the influence and authority of Mæcenas are to be estimated rather from his intimacy with the Emperor than his mere position as a public servant. This intimacy—friendship, it might, perhaps, be called—continued uninterrupted for many years; but some time before B.C. 16 it was ruptured from causes which cannot now be ascertained. No enmity, however, ensued. Mæcenas was a thoroughly sincere Imperialist. He had a belief in the value of an established government; and, when he found that he no longer retained the confidence of his sovereign, he did not lapse into a conspirator, but, as a modern minister might do, retired into the obscurity of private life. Literature and the society of literary men now occupied all his time. He was immensely rich, and kept an open table for men of parts at his fine house on the Esquiline Hill. Mæcenas's intercourse with Horace especially was of the most cordial nature and equally honorable to both. It was he that gave to the poet the famous Sabine farm of which Horace sings so exquisitely in his *Odes*. It was he, too, that requested Vergil to write his *Georgics*. The poet Propertius was also one of Mæcenas's more intimate friends. As far as personal morality went, Mæcenas was a thorough pagan; he dressed effeminately, had a passion for theatrical entertainments, and gave great attention to cookery and gardening. It does not surprise us to find that he was a valetudinarian and a hypochondriac. He died childless in B.C. 8. For the preserved fragments of his verses, see: Baehrens, *Fragmenta Poetarum Romanorum* (Leipzig, 1886); Harder, *Fragmenta des Mäcenas* (Berlin, 1889).

MÆCENAS, Gardens of (Lat. *Horti Mæcenatiani*). A magnificent pleasure ground laid out under Augustus by his minister Mæcenas, who planned the work in order to do away with the pestilential condition of the popular cemetery on the Esquiline (q.v.). Mæcenas covered the whole district with a layer of pure earth twenty-five feet deep and made the new ground into a garden. The effect on the city's health was marked, and is celebrated by Horace in his "First Satire."

In the gardens were a palace and a tower, from which, according to Suetonius, Nero watched the burning of the city in 64. The extant remains consist of some rooms paved with mosaic, and a fine building on the Via Merulana, once called an auditorium, but probably a conservatory. The hall is half underground and has seven curved steps in the apse. Each wall is pierced by six niches, both covered with finely executed landscapes, which have now faded away. Many works of art, in great part portrait busts, have been found on the site of the gardens, and are preserved in the Conservatory Museum.

MÆCIL′TUS AVI′TUS, Marcus. Roman Emperor of the West. He was a native of Gaul, and was sent by Aëtius as an emissary to Theodoric the Visigoth to persuade that monarch to make common cause against Attila. In the ensuing battle of the Catalaunian Fields (A.D. 451), he fought under Aëtius. After the murder of Maximus, he was proclaimed Emperor (455). In the following year he was deposed by Ricimer and died of starvation in a sanctuary in which he had been blockaded.

MAELAR, mā′lär. A lake of Sweden. See Mälar.

MÆLDUNE, māl′dōōn. See Maildun.

MAELSTROM, māl′strom. See Malström.

MÆ′NADS (Gk. Μαινάδες, *Mainades*, from μαίνομαι, *mainomai*, to rave). A name given to the Bacchantes (q.v.), from their frenzied state in the Dionysian worship.

MÆONIDES, mē-ŏn′ĭ-dēz, or **MÆONIAN SWAN.** A name given to Homer from his supposed birthplace in Mæonia.

MÆO′TIS PA′LUS. An ancient name of the Sea of Azov, also called Cimmerium and Bosporicum Mare.

MAERCKER, mĕr′kĕr, Maximilian (1842-1901). A German agricultural chemist, born at Kalbe-an-der-Saale. He studied at Greifswald and Tübingen, in 1866 was appointed assistant at the Brunswick agricultural experiment station, in 1867 at that of Weende-Göttingen. In 1871 he became director of the experiment station of the Central Agricultural Union (later the Chamber of Agriculture) for the Province of Saxony at Halle, and, in 1872, professor of agricultural chemistry in the university. He effected improvements in methods of tillage, and organized among agriculturists a system of practical experimentation regarding the fertilization of land and the feeding of stock. To the furtherance of sugar manufacturing, an important industry in the province, he also greatly contributed. In 1893, under commission from the Ministry for Agriculture, he studied American agricultural methods as displayed at the Chicago Exposition. Partial results of his investigations appeared in the essay, "Die Landwirtschaft in Deutschland und Amerika," published in Mentzel and Lengerke, *Landwirtschaftlicher Kalender* for 1895. In this essay he recommended the establishment of an experimental farm of the American type, and such a farm, the first in Germany, was instituted under his direction in 1895 at Lauchstädt, near Halle. He also wrote, besides contributions to periodicals, *Die Kalisalze und ihre Anwendung in der Landwirtschaft* (1880). Consult Behrend-Hohenheim, *Max -Maercker, Ein Rückblick* (in the *Landwirtschaftliche Jahrbücher*, vol. xxxi., part i., Berlin, 1902).

MAERLANT, mär′lȧnt, Jacob de Coster van (c.1235-c.1291). A Flemish poet, called, not unjustly, the father of Dutch literature, for in him are combined its learning, its practical sense, its didactic zeal, and its aversion to chivalrous ideals. He was born near Bruges and died at Damme, near Bruges. At first Maerlant yielded to the universal vogue of the romance of chivalry. He was parish clerk at Maerlant when he adapted from the French an *Alexander* (1257; printed 1860-61 and 1882) and a *History of Troy* (1264, printed in part, 1874 and 1889). He also rendered into Dutch a *History of the Graal* and the *Book of Merlin*. Then, moving to Damme and becoming chancellery clerk, he first turned his mind to present social conditions in three strophic poems, called the *First*, *Second*, and *Third Martin* (printed 1880), and then began the series of didactic works with which his name is especially associated by *The Secret of Secrets*, a treatise on government (printed 1838). *Flowers of Nature* (printed 1878) followed, an adaptation of Cantimpré's Latin *De Rerum Nàtura*. Then came the most famous of his books, *The Rhymed Bible*, based on the *Scholastica* of Comestor with an addition from Josephus on the fall of Jerusalem (1271; printed 1858-69), a work that brought him into conflict with some of the clergy, though the Franciscans soon after employed him to translate into Dutch Saint Bonaventure's *Life of Saint Francis* (printed 1848). He then (1283) began his most extensive work, a popularization of the *Mirror of History* by Vincent of Beauvais (printed 1857-63), which he did not live to finish. He wrote also in his last years a fine crusader's song, *Of the Land Over-Sea.* Consult: Serrure, *J. van Maerlant, en zijne iverken* (Ghent, 1867); J. te Winkel, *Maerlants Werken*, etc. (Leyden, 1877) and *Geschiedenis der Nederlandsche Letterkunde*, part i. (ib., 1887).

MAES, or **MAAS**, mäs, NICOLAS (1632-93). A Dutch genre and portrait painter. He was born at Dordrecht and was a pupil of Rembrandt. The genre paintings of his early period, executed in the manner of Rembrandt, are real masterpieces. Among these are "Old Woman Spinning," and a "Girl at a Window," in the Amsterdam Museum; the "Cradle," "Dutch Housewife," and "Idle Servant," in the National Gallery, London; "Killing Pigs" and a "Bishop Reading," in the Berlin Museum; and "Saying Grace," in the Louvre. His work declined with the declining taste of the age, and his portraits, of which there are examples in the galleries of Amsterdam and Rotterdam, are vapid in their smoothness of finish, like those of Netscher. He resided at Antwerp from 1660 to 1665, and in 1668 settled permanently at Amsterdam, where he died in 1693.

MAESHOWE, mās′hou. An artificial tumulus, situated on the island of Orkney, about nine miles west of Kirkwall and a little more than a mile from the standing stones of Stennis (q.v.).

MAESTEG, mīs′tĕg. A coal-mining town in Glamorganshire, Wales, eight miles southeast of Neath (Map: Wales, C 5). Population, in 1891, 9400; in 1901, 15,000.

MAESTOSO, mä′ĕ-stō′sō. An Italian term in music, meaning with majesty or dignity.

MAESTRAL. See MISTRAL.

MAESTRICHT, or **MAASTRICHT**, mās′trikt (Lat., *Trajectum ad Mosam*, i.e. 'Meuse crossing'). The capital of the Province of Limburg, Netherlands. It is situated 19 miles north of Liège, Belgium, on the left bank of the Meuse, over which a stone bridge, built in 1683, leads to the suburb of Wijk, where the railroad station is (Map: Netherlands, D 4). It is well built and has several interesting buildings. On the great market-place stands the beautiful town hall, with its clock-tower, dating from 1659-64. The building contains several Dutch paintings and fine tapestries. The Hoofdkerk, or Church of Saint Servatius, built partly in the Romanesque, partly in the Gothic style, is the oldest church in the Netherlands. It has an altarpiece by Van Dyck, and its crypt contains, besides the tomb of Saint Servatius, a number of interesting ecclesiastical utensils of the twelfth and thirteenth centuries. The town has a library with the provincial archives, an athenæum, and several technical schools. Probably the most remarkable attraction of the neighborhood is the Petersburg sandstone quarries, worked from Roman times until quite recently, and consisting of a labyrinth of subterranean passages extending over a vast area. The chief industries of the town consist of brandy-making and beer-brewing, and the manufacture of woolens, glass, earthenware, soap, paper, and arms.

Maestricht was early the seat of a bishop, and was in the latter part of the Middle Ages in the joint possession of the dukes of Brabant and the bishops of Liège. Owing to its strategical position on the frontier, it has often borne the brunt of war. In 1579 it was captured and sacked by the Spaniards under the Duke of Parma, and thousands of its inhabitants were massacred. It was captured by Prince Frederick Henry of Orange in 1632, and in 1673, 1748, and 1794 by the French. In the Belgian revolution of 1830 it was almost the only town along the frontier which withstood the attack of the insurgents. Its fortifications have been razed. Population, in 1892, 32,676; in 1900, 34,220.

MAESTRICHT BEDS. An important formation of soft yellowish limestone occurring at Maestricht in Holland, abounding in the remains of corals and Bryozoa, sometimes, indeed, entirely made up of them. The fossils are peculiar, and quite distinct from Tertiary species. It overlies the chalk stratigraphically.

MAESTRO, mȧ-ĕs′trō (It., master). An Italian term, used in the same general sense as the English word master. The *maestro al cembalo* was the conductor of opera in Italy during the first half of the nineteenth century. He did not direct by means of a bâton, but played the cembalo (piano) and directed very much as the pianist does to-day in a performance of chamber music for piano and strings. Rossini, Bellini, Donizetti, all directed their works from the cembalo. (See CONDUCTOR.) *Maestro di capella* is the conductor and trainer of a choir; *maestro dei putti*, the conductor of the boys' choir at Saint Peter's in Rome.

MAETERLINCK, mä′ (*or* mâ′) tĕr-lĭnk, MAURICE (1862—). A Belgian poet, born August 29, 1862, in Ghent. He studied in a Jesuit school, then pursued philosophy and law. In 1887 he became a barrister, but in 1896 he settled as a man of letters in Paris. He first wrote *Serres chaudes* (1889), and added to these verses *Douze chansons* (1896). One of these betters an inspiration which Rossetti, in "An Old Song Ended," had got from Ophelia's song in *Hamlet* (Act iv., Scene 1). His dramas, *La princesse Maleine* (1889); *Les aveugles* (1890); *L'intruse* (1890); *Les sept princesses* (1891); *Pelléas et Mélisande* (1892); *Alladine et Palomides: Intérieur* (1894); *Mort de Tintagiles* (1894); *Aglavaine et Sélysette* (1896); and *Monna Vanna* (1902), which closely resembles Browning's *Luria*, are dramatic in form, but their symbolism or mystic quality so greatly lessens their dramatic effect that they are seldom played. Maeterlinck's spirit is imbued in mysteries. He is symbolistic, though by no means the earliest modern symbolist. He broods over death, and sees life with poetic rather than accurately analytic vision. He lives in a dreamy atmosphere, and the puppets in his dramas are rather such stuff as dreams are made of than men and women. Without passion or will, enthralled by Maeterlinck's spirituality, they wander blindly. They are either ghosts or marionettes. It is natural, therefore, that Maeterlinck should appeal not to the public in general, but rather to a special school of admirers who have studied his idiosyncrasies. To the thinking of many critics Maeterlinck is best in his essays.

They, in truth, demand no strong portrayal of human character, and their author is free to charm by the simple and untrammeled utterance of his views of life. *Le trésor des humbles* (1876), *La sagesse et la destinée* (1878), and Maeterlinck's *Introduction* to his translation of Ruysbroeck's *L'ornement des noces spirituelles* express Maeterlinck's mystic philosophy. *La vie des abeilles,* translated by Sutro (New York, 1902), is an artist's study of bee life. Here Maeterlinck's sensuous outlook on life, his painter's vision, has no need of psychology; for he is dealing with throngs rather than with individuals, yet there is in his setting forth of the bee's activity, intelligence, instinct, and beauty a precision which shows that he got his knowledge mostly at first hand. This he tells us, though he also acknowledges his debt to honey-gathering and to purely scientific students of the bee. *La vie des abeilles* is perhaps Maeterlinck's soundest creation. His dramas, which were translated by Richard Hovey (New York, 1896), show the influence of the Elizabethan playwrights. Their weird unreality suggests such writers as Villiers de l'Isle-Adam (whom Maeterlinck met in Paris in 1896) and De Quincey, Rossetti, and Poe, as well as mystic writers of bygone ages. A collection of ~~Maeterlinck's~~ dramas appeared in 1901.

MÆVIUS, mē'vĭ-ŭs. A Latin poetaster, whose name usually is coupled with another similar writer, Bavius (q.v.).

MAFEKING, mä'fe-kĭng'. A town of British South Africa, the seat of the administration of the Bechuanaland Protectorate, situated near the western frontier of the Transvaal Colony, 96 miles by rail northeast of Vryburg (Map: Transvaal Colony, B 4). It became famous during the Boer-British War of 1899-1902 as the place where the British, under Col. Baden-Powell, were besieged by the Boers under Cronje from October 11, 1899, to May 18, 1900. They were relieved by a British column under Colonel Mahon. The locality had no strategical importance, except that in the first stages of the campaign it was part of the Boer plan of campaign to capture the British force stationed there, or at least to prevent them from assuming the offensive in some other part of the theatre of war.

MAFFEI, mȧf-fä'ē, ANDREA (1800-85). An Italian poet, born at Riva di Trento. He studied German and English, and made himself widely known by his translations from these two languages. Among them are the complete dramatic works of Schiller (1844) and Milton's *Paradise Lost* (1857). He also translated several poems of Byron and Moore, some of Goethe's works, and Shakespeare's *Macbeth, Othello,* and *The Tempest* (1869). His original volumes are *Dal Benaco* (1854), and a larger collection of poetry, *Versi editi ed inediti* (1858-60).

MAFFEI, GIOVANNI PIETRO (1535-1603). An Italian Jesuit historian, born in Bergamo. He was professor of eloquence at Genoa in 1563, and was made secretary of the Republic in the following year. Later he became a Jesuit (1565) and taught rhetoric in the Jesuit college at Rome. He is best known for his monumental *Historiarum Indicarum Libri XVI.* (1588; best edition Cologne, 1593), a valuable work, which occupied him for twelve years. An edition of his Latin works was published at Bergamo in 1747.

MAFFEI, SCIPIONE, Marchese (1675-1755). An Italian dramatist and scholar, born at Verona, June 1, 1675. He received his training with the Jesuits at Parma and then spent some time in the army under his brother Alessandro, a general in the Bavarian service, taking part in the battle of Höchstädt (1704). After his return to Italy, he published the book, *Della scienza cavalleresca* (Rome, 1710), in which he censured the practice of dueling. With two others he started in 1710 the *Giornale dei letterati.* Interested in the older Italian stage, he prepared an edition of some of its best plays and prefixed thereto a dissertation of his own. But he did still more for the native theatre by composing his *Merope,* the first Italian tragedy of incontestable excellence, which was performed in 1713 and printed for the first time at Venice, 1714. This drama was translated into several foreign languages, and it seems that Voltaire at first meant to translate it into French, and only later decided to write an independent drama. The French writer did, however, imitate some scenes of the Italian work, and a controversy of a bitter nature arose between the two authors. Maffei's erudition revealed itself in a number of treatises, e.g. in the *Istoria diplomatica* (Mantua, 1727), the *Verona illustrata* (Verona, 1732), and the *Galliæ Antiquitates,* which he published at Paris (1733), after a journey of investigation made through Provence. While in France he studied the Jansenistic movement, and dealt with it in his *Istoria teologica,* etc. (Trent, 1742). He attacked current prejudices in the *Dell' impiego del denaro* (1746), in which he demonstrated that loans on interest are not prohibited by moral law or by the Scriptures, and he renewed his attack in the *Arte magica* (1749-54). Against an enemy of the stage, the cleric Concina, he directed the *Trattato de' teatri antichi e moderni,* which received the sanction of Pope Benedict XIV. Works on physics, entomology, and other subjects show his scientific attainments. Consult: Maffei's *Opere* (21 vols., Venice, 1790) and the selected *Opusculi letterari* (Venice, 1829, and Milan, 1844); Pindemonte, "Elogio del marchese Scipione Maffei," in the *Elogie di letterati italiani* (Florence, 1859); Giuliari, "Bibliografia maffeiana," in the *Propugnatore* for 1885.

MAFFIA. See MAFIA.

MAFFIT, JOHN NEWLAND (1819-86). An American naval officer, born at sea in 1819. He entered the United States navy as a midshipman in 1832, and was promoted to a lieutenancy in 1848. In May, 1861, he withdrew from the Federal service and entered that of the Confederacy. The next year he took charge at Nassau of the *Oreto,* a steamer that had been built for the South at Liverpool. He carried the vessel to the island of Green Key, where he renamed her the *Florida* and took on board guns and ammunition that had been sent from Nassau. After a visit to Mobile he set out in January, 1863, on a long and adventurous cruise, in the course of which he captured a great many prizes, one of them alone being of the value of $1,500,000. Toward the end of the year, however, while his vessel was being repaired in the port of Brest, Maffit's health gave way, and he resigned his command.

MAFIA, mä'fē-ȧ. A secret organization, especially prevalent in Sicily, where it frequently interferes with the law. Its origin is shrouded in mystery, but probably it arose gradually during the centuries of oppression under which Sicily and other parts of Italy suffered. The object of this society is to guarantee its members, who are known as *Mafiosi*, immunity for any crimes which they may commit. It is divided into sections, and there are passwords to enable members to recognize each other. There is a distinction between the *Mafiosi* of the mountains and those of the commercial cities. In the mountains the crimes are of the ruder sort, while along the coast and in the cities numerous assassinations and other terrible crimes have been perpetrated under the protection afforded by the Mafia. The essence of the constitution of the Mafia has been declared to be: Ready, passive, and constant obedience to the head of the band; absolute silence as to the composition and enterprises of the band; material, moral, and pecuniary aid to all members, especially when arrested; never to have recourse to legal authority, but to refer all disputes to the leader of the band. The penalty for a violation of any of these obligations is invariably death. Members are subjected to an elaborate initiation, and the society claims in Sicily as members people from all ranks of society, and the whole of the island is still terrorized by the Mafia. General meetings are frequently held at the great cattle fairs, and the members of every grade assemble and adjust their reciprocal interests, devise their criminal projects and plan their execution. The Italian Government has frequently sought to suppress the Mafia, which in late years seems to be allied with anarchistic movements. In 1902 the Government succeeded in convicting one of the leaders, Baron Palizzolo, a member of the National Legislature, for the murder of Marquis Notarbartolo, by transferring the trial to Northern Italy. An account of this affair is to be found in *Die Zukunft* (Berlin, 1900). The baneful influence of the Mafia has also made itself felt several times in the United States, notably in New Orleans in 1890, where it was suspected of having caused the murder of the chief of police, and led to a riotous demonstration on the part of the citizens which resulted in the death of eleven Italians who were held in prisons under suspicion of complicity in the crime. Consult the article "Mafia," in *Chambers's Journal*, vol. lxix. (London, 1892); Vizzini, *La Mafia* (Rome, 1880); Alongi, *La Mafia* (Turin, 1886); Cutrera, *La Mafia e i Mafiosi* (Palermo, 1900).

MAGADHA, mŭg'hä-dȧ. One of the principal kingdoms of India when Alexander the Great invaded the country, B.C. 327. It comprised the larger part of Southern and Central India, and its power lasted till about A.D. 450. The capital of Maghada was Palibothra, on the Ganges, which probably occupied the site of the present Patna. Seleucus, one of Alexander's generals, to whom Bactria was given, including the provinces on the Indus, attempted conquests beyond that river, and was involved in war with Chandragupta, King of Maghada, called by the Greeks Sandrocottus (q.v.), who reigned from B.C. 315 to about 291. One of the Maghada kings, Bimbisara, is famous as the friend and patron of Buddha when he began his mission as a religious teacher.

MAGADINO, mä'gȧ-dē'nō. A town in Switzerland on Lake Maggiore (q.v.).

MAGALHÃES, mȧ-gȧ-lyä'ĕɴsh, Domingo José Gonçalves de (1811-82). A Brazilian writer, born in Rio de Janeiro, 1811, of an old Portuguese family. He was educated as a physician. In 1836 he was attached to the Brazilian Embassy at Paris. Returning to Rio in 1838, he became professor of philosophy, and then successively member of the Chamber of Deputies and Ambassador at Naples, Turin, and Vienna. He remained at Vienna from 1859 to 1867 and then became Ambassador at Washington (1867-71), whence he returned to spend several years at home. Finally he undertook the embassy at Rome and died there, July 10, 1882. Having begun as a classicist in his *Poesias* (1832), he soon joined the romantic movement, and between 1830 and 1840 he was one of the chief poets of Brazil. The first really important lyrics are, probably, his *Suspiros poeticos* (1836). Mediocre works, and notable chiefly as the first tragedies by a Brazilian, are his *Antonio José* (1838); *Olgiato* (1841); and *Amancia* (1844). The most famous work of Magalhães is the epos *A confederação dos Tamoyos* (1857). The elegiac *Mysterios* is of 1858. Of his prose treatises there may be mentioned the *Ensaio sobre a historia litteraria do Brasil* (1839), and the *Factos do espirito humano* (1858). His *obras completas* were published at Paris in 1864 and later. Consult Wolf, *Ueber Dom J. G. de Magalhães* (Vienna, 1862); and id. in *La littérature brésilienne* (Berlin, 1863).

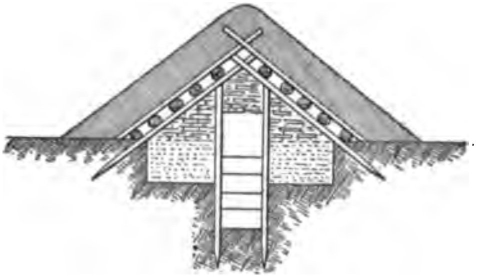
MAGALHÃES, Fernão de (very commonly known by the Spanish form of his name, Fernando de Magellanes, Anglicized to Magellan (?-1521). The discoverer of the Strait of Magellan, and the first European navigator to sail across the Pacific Ocean. He was born at Villa de Sabroza, District of Villa Real, Traz os Montes, in Portugal, of a noble or hidalgo family. The date is not known. He went to India with the first Viceroy, Dom Francisco d'Almeida, and by 1510 had acquired sufficient rank and reputation to be included in an important council of war summoned by Albuquerque. In January of the same year he had started to return to Europe, but two vessels of the fleet stranded off the Maldives, and Magalhães assumed charge of them, keeping the crews in order with great skill while the remaining officers returned to Cochin for assistance. After he reached Portugal, Magalhães was stationed at Azamor in Morocco, conducting the operations against the Arabs, until he became involved in a dispute over the distribution of booty, which led him to go back to Portugal without the permission of his superiors. This is supposed to have influenced the King in refusing to grant him an increase in his royal allowance, for which he had petitioned, and this refusal in turn led him to forswear his native country and offer his services to the King of Spain in 1517. Magalhães had learned, probably from the captain of some stray trading vessel who had tried his fortunes in the southwestern Atlantic, that there was a water passage opening toward the west, and he promised Charles V. to find a way westward to the Spice Islands. After many vexatious delays caused by the agents of the Portuguese Government and by the Spanish officials who were jealous of the Portuguese mariner, Magalhães set sail from Seville with a fleet of five vessels, August 10, 1519. In December he was at Rio de Janeiro, and in February, 1520, he reached the entrance to the Rio de la Plata. The next six months were occupied by difficulties with his crews, and the loss of one vessel, so that it was October 21, 1520, before he arrived at the entrance to the strait known by his name, but named by him Todos los Santos. A month later, November 28th, he completed the passage and entered the Pacific Ocean. One of his vessels had meanwhile deserted him, and after many adventures made its way back to Seville, where it reported the destruction of the fleet. After a smooth and pleasant voyage, whence the name of Pacific given to this ocean, Magalhães reached the Tiburones Islands in February, 1521, and on March 6th he was at the Ladrones. Ten days later he fetched Samar, and during the next six weeks visited the other islands of the Philippine group. Friendly relations were established with the ruler of the island of Cebú, with whom Magalhães joined his forces in an attack on the natives of the island of Mactan. While conducting a rearguard defense after his partisans had been routed, Magalhães was killed, April 27, 1521. After this disaster, one of the vessels was burnt, and the remaining two proceeded to Tidore, in the Moluccas, where the *Victoria*, of which Sebastian del Cano had become commander, was refitted for the voyage back to Spain. She sailed December 21, 1521, doubled the Cape of Good Hope on May 19, 1522, and on Monday, September 9, 1522, dropped anchor in Seville Roads, having completed the first voyage around the world. The documents and original narratives relating to this voyage and to the life of Magalhães are in the Hakluyt Society volume for 1874, translated and edited by Lord Stanley of Alderley.

MAGALHÃES, Fray GABRIEL DE (1609-77). A Jesuit missionary to China, born at Pedrogão in Portugal. He went to India in 1634, came to China in 1640, and was treated with great honor by the Emperor. Twice escaping martyrdom, he died peacefully, and was honorably buried. He wrote *Nouvelle relation de la Chine*.

MAGALLANES, mä′gȧ-lyä′nâs. A territory of Chile, comprising all that part of the country lying south of the 47th parallel, which separates it from the Department of Chiloe. It includes the numberless islands which fringe the western and southern coasts, and its entire area is estimated at 75,000 square miles. The mainland is a narrow strip of land largely mountainous and with extremely broken coasts, which fall into the sea in rocky and gloomy cliffs, in some places covered with glaciers. Numerous narrow channels enter far into the country, forming many peninsulas. The climate in that part of Chile is extremely damp and stormy, and rains occur during the greater part of the year. There are extensive pine forests, but very little agricultural land. Among the chief groups of islands belonging to the territory are the Wellington group, Madre de Dios, Hanover, Queen Adelaide Archipelago, and the western part of Tierra del Fuego. The population of the territory was 5170 in 1895, more than half of whom lived in the chief settlement, Punta Arenas, on the Strait of Magellan.

MAGAZINE (OF., Fr. *magazin*, It. *magazzino*, from Sp. *magacen*, from Ar. *makhāzin*, plural of *makhzan*, storehouse, from *khazana*, to store up). A storehouse, or a place or building set apart for the safe keeping of stores; in military usage a powder storehouse. Modern military magazines are used solely and entirely as storehouses of powder and ammunition and not as formerly, when they were practically complete armories. An *expense magazine* is usually one from which is issued the daily ammunition requirements of the troops to which it belongs. In fortifications—field or coast, permanent or temporary—the expense magazine is within easy access of the point of employment, and is an important consideration in the general scheme of defense. They are constructed according to the general designs of the fortifications of which they are a part and may be of underground construction or built in the defenses and protected by bomb-proofs and similar devices. See FORTIFICATION.

On board ship magazines are compartments designed solely for powder or for fixed ammunition of large calibre guns. They are placed as far away from the engine and fire rooms and as low down in the ship as practicable; and their tops are always well below the water-line. In recently built modern ships magazines are watertight compartments with bulkheads or walls of steel lined with thin sheets of fire-proof wood or asbestos board and having fire-proof wood gratings on the deck or floor. In some ships the bulkheads surrounding the magazine are double, the air-space between assisting to keep the magazine walls from becoming too warm; and the magazines themselves are fitted with ventilating pipes for the escape of hot air and with other pipes to bring cool air from the refrigerating plant. The artificial cooling is only necessary in the tropics, and rarely then, but modern smokeless powders give more even and regular results if the temperature is kept below 100° F., and long storage at temperatures exceeding 110° is liable to cause them to deteriorate. Magazines, ammunition rooms, and shell rooms are lighted by electric lamps in *light boxes*, with glass in the sides; these boxes can only be entered from the deck above and not from the magazine, and if the electric lamps fail oil lights or candles are substituted. For further safety magazines, ammunition rooms, etc., are fitted with flood-cocks so that they may be filled with water if the ship is on fire near them; also with drain pipes for letting the water out. As a protection against fire in action the ammunition hoists do not extend into the magazines, but down to ammunition passages or handling rooms



A FIELD MAGAZINE.

leading to them, the ammunition being passed out of the magazines through holes in the doors, which are kept closed. As a further precaution men working in the magazines wear a special magazine dress, shoes without nails, and a long smock shirt or jumper of light serge; and no iron or steel fittings or tools are allowed inside the magazine doors.

MAGAZINE GUN. See SMALL ARMS.

MAGAZINES. Periodicals either devoted to general literature, art, or science, or to some particular branch of human knowledge. The name 'magazine' was first applied to them as being 'storehouses' of varied information. For full account of their history, classes, and scope, see PERIODICAL.

MAG'DALA, mäg'dȧ-lȧ. The most strongly fortified town of Abyssinia, situated near the centre of the country, about 120 miles southeast of Gondar (Map: Africa, H 3). It lies on the summit of an isolated basalt block, a mile square in extent, and with perpendicular sides in some places 2000 feet high. Magdala was stormed by the British forces under Sir Robert Napier on April 13, 1868 (see ABYSSINIA), and was destroyed. It was, however, soon restored to its former position, and is at present of considerable strategic value.

MAGDALA (Lat., from Gk. Μαγδαλά.) A place name found in Matt. xv. 39 (Authorized Version) for which the Revised Version substitutes Magadan as the better supported reading. The parallel passage in Mark viii. 10 reads Dalmanutha. It is generally supposed that Magdala was somewhere near the wretched modern village Mejdel in the southeast corner of the Plain of Gennesaret. This identification is somewhat doubtful. Notices in the Talmud imply a Magdala south of Tiberias. The name Magdala, evidently from the Hebrew *Migdal* (tower), was probably not rare. There may have been several towns or places so named near the Sea of Galilee, one of which was the home of Mary Magdalene (i.e. of Magdala).

MAG'DALEN. A favorite subject of the Italian painters. Among famous pictures are those by Correggio (Dresden), by Titian (Florence and Saint Petersburg), by Tintoretto (Venice), Paul Veronese (Turin), and Rubens (Lille).

MAG'DALE'NA. The principal river of Colombia (Map: Colombia, C 1). It rises in the southwestern part of Colombia near the junction of the Central and Eastern Cordilleras of the Andes, and flows northward through the long and narrow valley formed by those two ranges until it enters the Caribbean Sea by two arms separating at the city of Barranquilla. Its total length is over 1000 miles. In its upper course it is an impetuous mountain torrent flowing through narrow, rocky defiles, forming numerous falls and rapids, and even in its lower course it has a very swift current. It is navigable for ocean steamers to the head of the delta at Barranquilla, and for steamers of 300 tons to Honda, 600 miles from its mouth. At Honda there is a series of rapids 20 miles in extent, above which the river again becomes navigable, though with difficulty, for 200 miles farther to Neiva. Connection is made between the upper and lower courses by a short railroad passing around the rapids of Honda. Owing to the narrowness of its valley, the tributaries of the Magdalena are all very short, with the exception of the Cauca (q.v.), whose length equals that of the main river from the point of junction. Until railroads are built the Magdalena will offer practically the only commercial route to the interior of Colombia, and it is now navigated by forty regular steamers. The river was discovered in 1502 by Rodrigo de Bastidas.

MAGDALENA. The northernmost department of Colombia, South America. It is bounded by the Caribbean Sea on the north, Venezuela on the east, the Colombian Department of Santander on the south, and is separated from Bolívar on the west by the Magdalena River. Its area, including the peninsula of Goajira, is about 27,000 square miles. The portion along the coast is occupied by the isolated range of Sierra Nevada de Santa Marta, exceeding in altitude 17,000 feet. The peninsula of Goajira is also more or less mountainous and along the eastern frontier is the Sierra de Perija. In the west and south the surface is mostly flat and occasionally swampy and overgrown in parts with dense forests. This part of the country is well watered and affords good grazing land. Coffee, sugar, and cereals are the chief products, and grazing is carried on to some extent; hides and a fine breed of horses are exported. The mineral deposits are believed to be important, but almost entirely neglected. The population was estimated in 1896 at 100,000, including about 40,000 uncivilized Indians, many of whom are still irreconcilably hostile to the whites. The capital is Santa Marta (q.v.).

MAGDALENA BAY. A port of Mexico, situated on the Pacific coast of Lower California. It is one of the best harbors on the Pacific coast, affording deep water in a lagoon or inlet 40 miles long inside a sand-bar or beach. It is the seat of a United States consular agent.

MAGDALEN (mạd'lĭn) **COLLEGE.** One of the most beautiful and famous of Oxford colleges. It was founded as Saint Magdalen Hall in 1448, and as the College of Saint Mary Magdalen in 1458, by William Patten, better known as William of Waynflete. There were, in 1902, a president, thirty fellows, several senior demies or half fellows (not exceeding eight), thirty junior demies, a number of exhibitioners, twelve tutors, four lecturers, four chaplains, a choir, college officers, and from 175 to 200 undergraduates. There is, in connection with the college, Magdalen College School, founded in 1480 as a grammar school preparing for the college and the university, after the manner of Winchester and Eton. Waynflete established also, with his new foundation, four professorships of moral and metaphysical philosophy, chemistry, physiology, and pure mathematics. The buildings, begun in 1475, are among the most beautiful in England. The grounds are extensive, comprising over 100 acres, including a deer park, and are most attractive. Magdalen has, from its foundation, been one of the richest of English colleges. It is rich in historical associations, and is especially to be remembered for the attempt of James II. to force a Roman Catholic president on the college, one of the causes of his downfall. The college is still one of the strongest in Oxford. It presents to forty benefices. Among the more distinguished of its members may be mentioned the grammarian Lily, Cardinal Wolsey, Bishop Foxe, Tyndale, John Lyly, John Hampden, Philpotts, Addison, Gibbon, and Lord Selborne. See Oxford University; Wolsey; James II.

MAGDALENE (măg′dȧ-lĕn) **COLLEGE.** A college at Cambridge University, England. Though nominally dating from 1519, it really began its career in 1542. It was founded by Thomas, Baron Audley, of Walden, and Chancellor of England, on the site of a Benedictine house founded in 1428, called Monks' Hostel, later Buckingham College. It was endowed partly by property in London and partly by spoils of the monasteries. One peculiarity of the foundation is that the master is nominated by the owner of Audley End, the country-seat of the founder. The college possesses three libraries, the college library proper, the Peckard library, and the Pepysian library. The latter, contained in a separate building, is the collection of Samuel Pepys (q.v.), the diarist, and contains the manuscripts of his diary, together with other rare and curious documents, including the love letters of Henry VIII. to Anne Boleyn, the whole having been given by Pepys, who was a member of the college. There were, in 1902, in Magdalene College, a master, a president, three foundations and four honorary fellows, college officers, lecturers, tutors, and some sixty undergraduates. The college presents to six livings. Its distinguished members include archbishops Grindal, Usher, and Cranmer. See Cambridge University; Pepys.

MAGDALEN (mạd′lĭn) **HALL.** Once a college at Oxford, England, established by William of Waynflete at the same time as his foundation of Magdalen College (q.v.). It was designed as a school for students previous to their admission to that college, and was presided over by one of the fellows of that foundation. In 1602 it became an independent hall and so remained till 1816, when Magdalen College resumed the premises, transferring the members of the hall to the premises of Hertford College, which were acquired for them in 1822. In 1874 the hall was dissolved and reincorporated as Hertford College. While it was still a hall, Tyndale, the poet Daniel, Lord Clarendon, Sir Henry Vane, and Hobbes were members. See Oxford University.

MAG′DALEN ISLANDS. A small group of islands belonging to Quebec, and situated near the centre of the Gulf of Saint Lawrence, 54 miles northwest of Cape Breton Island (Map: Canada, S 7). They consist chiefly of rocky cliffs, but contain some good soil suitable for agriculture. The inhabitants, who number about 5000, are chiefly supported by the productive cod, herring, and seal fisheries of the neighboring waters.

MAGDEBURG, mäG′de-bo͞orK. The capital of the Province of Saxony, Prussia, a first-class modern fortress, and one of the leading commercial cities of Northern Germany (Map: Prussia, D 2). It is situated principally on the left bank of the Elbe, here divided into three arms, 88 miles by rail west-southwest of Berlin. The portion on the left bank of the Elbe comprises the Altstadt, with its surrounding suburbs of Wilhelmstadt on the west, Neustadt on the north, Sudenburg on the southwest, and Buckau on the southeast. The citadel and the Grosser Werder are on two islands of the Elbe, and Friedrichstadt is on the right bank. The abandoning of the fortifications to the north and south of the old town during the second half of the nineteenth century considerably increased the area of the city, and the additional space has been utilized for modern quarters, as well as for parks. The ancient and irregular plan of the old town has also been somewhat improved. The present fortifications of the city consist of the citadel, a remnant of the old fortifications, and a number of detached forts and redoubts, built in 1866. The old town is intersected from south to north by a wide avenue (Breiter-Weg), lined with many fine shops and old-fashioned gable houses. The Kaiserstrasse, west of this street, is the principal thoroughfare of the town. Noteworthy monuments are the one to the Emperor Otho the Great on the Alte Markt, erected by the municipality about 1290, and recently restored, and that to William I. on the Kaiser Wilhelm Platz.

The Cathedral of Saints Maurice and Catharine, erected mainly in 1208-1363 and completed in 1521, is a magnificent Gothic structure, with some traces of the Romanesque. It has a fine polygonal choir, having carved stalls, many monuments and tombs, including those of Otho the Great and his wife Editha. The monument to Archbishop Ernest of Saxony, by Vischer, is especially elaborate, and there is a rare old chapter-room. The cathedral contains many ancient objects of interest. The other noteworthy churches are the Church of Our Lady, a cruciform Romanesque basilica of the eleventh century, attached to which are some beautiful cloisters, now used as a school; the Gothic Church of Saint Ulrich; the new Church of Saint Paul in Wilhelmstadt; and the synagogue. The most notable secular buildings are the Rathaus (1691), the old royal palace, now used as a museum, the administration building, the exchange, and the Reichsbank.

In the way of educational institutions Magdeburg has a pedagogical seminary, three gymnasia, several 'real' schools, an industrial art school, and a technical school. Among the collections are a public library of about 30,000 volumes, the archives of Saxony, and a museum with collections of paintings, engravings, sculptures, etc. The economic importance of the city is considerable. Besides being one of the principal centres of the beet-sugar industry in Germany, and well known for its fine fruit and vegetables, Magdeburg has great machine works. Among them are the famous Gruson Works at Buckau, now a part of the Krupp Works, and employing about 3000 persons. In addition there are extensive distilleries, chemical works, and manufactures of chicory, chocolate, tobacco, cigars, cement, artificial fertilizers, pottery, ribbons, gloves, and musical instruments.

The commerce is extensive, especially in beet sugar. Local manufactures, agricultural and colonial products, and books are also largely dealt in. Traffic is favored by frequent markets and an annual two weeks' fair in September. A considerable part of the commerce is carried on by water. The city has latterly constructed a fine harbor. The municipal administration is in the hands of a chief burgomaster, a burgomaster, a council of seventy-two members, and a board of twenty-five magistrates. The municipality owns the water works and the gas works, both of which it operates at a profit. It also has a savings institution. The budget for 1902-03 balanced at $2,258,620. The larger part of the revenue is derived from direct taxes. The total figures as to population swelled very rapidly during the second half of the nineteenth century on account of the annexation of suburbs as well as of adjacent independent communities. From 84,401 in 1871, the figures rose to 202,234 in 1890 and to 229,663 in 1900. The inhabitants are mostly Protestant.

HISTORY. Magdeburg first appears in history in the ninth century, and in 937 a monastery was erected there by Otho the Great. In 968 the city was made the seat of an archbishop, and was henceforth an outpost against the Slavs, becoming later an important commercial city and a member of the Hanseatic League. The municipal law developed in Magdeburg in the Middle Ages, and known as the Magdeburg Right, was widely adopted in the granting of charters to cities in Germany and elsewhere. The city was very prominent during the course of the Reformation, which it adopted in 1524. It declined to make any compromise with Charles V., and hence was besieged in 1550 by Maurice of Saxony, whom in 1551 it was compelled to accept as overlord. It subsequently came under the control of Brandenburg, since the successors of its old archbishops, the so-called 'administrators,' were chosen from the Hohenzollern. During the Thirty Years' War it suffered greatly; besieged unsuccessfully by Wallenstein in 1629, it was once more invested in 1631, this time by Tilly, the Imperial general. The citizens hoped for rescue from the Swedish King, Gustavus Adolphus, but he was delayed by negotiations with the Electors of Brandenburg and Saxony, who refused him passage through their territories. On May 20 (May 10, old style), 1631, the city was taken by surprise, and destroyed almost completely. Thirty thousand of the inhabitants perished. During the rest of the Thirty Years' War it changed hands repeatedly, until in 1638 Duke Augustus of Saxony became Administrator. By the Peace of Westphalia (1648) it was to become the possession of Brandenburg after the death of Duke Augustus. This occurred in 1680. From that time Magdeburg has shared the history of Brandenburg and Prussia. During the Napoleonic wars it fell into French hands (1806), but by the Peace of Paris (1814) was returned to Prussia. For its rôle in the Thirty Years' War, consult: Dodge, *Gustavus Adolphus* (New York, 1896); Klopp, *Tilly im dreissigjährigen Kriege* (2d ed., Paderborn, 1894-95); also Wolter, *Geschichte der Stadt Magdeburg* (3d ed., Magdeburg, 1901).

MAGDEBURG CENTURIES (Lat. *Centuriæ Magdeburgenses*). The name given to the first comprehensive Protestant work on the history of the Christian Church. The arrangement of this work was such that it devoted a volume to each century, whence the name 'centuries,' and the authors were called 'centuriators'; it is called *Magdeburg* Centuries because begun in that city (in 1552). The chief of the centuriators was Matthias Flacius (q.v.), and his principal collaborators were Johann Wigand, Matthias Judex, Basilius Faber, Andreas Corvinus, and Thomas Holzhuter. The expenses of the work were borne by certain princes and noblemen. It was published at Basel (1559-74) in 13 volumes, bringing the history down to 1300. Six volumes of a new edition by Baumgarten and Semler appeared at Nuremberg (1757-65).

MAGDEBURG HEMISPHERES (so called from the place where they were invented). Two hollow hemispheres, of copper or brass, with their edges accurately fitting each other, one of which is furnished with a stop-cock. When the edges are rubbed with grease, pressed tightly together, and the globe thus formed exhausted of air by means of an air-pump, the hemispheres, which fell apart before exhaustion, are now pressed together with immense force; e.g. if they are one foot in diameter, they will, after exhaustion, be pressed together with a force of nearly a ton. This experiment was first performed by Otto von Guericke (q.v.) in 1654 at the Imperial Diet at Ratisbon.

MAGEE, m'gē′, WILLIAM CONNOR (1821-91). An English prelate. He was born at Cork; was educated at Trinity College, Dublin, and held a curacy in that city, which ill health compelled him to relinquish. Later he held two cures in Bath, and became minister of Quebec Chapel, London, in 1859. A year later he returned to Ireland, where he became rector of Inniskillen, and Dean of Cork in 1864, as well as dean of the Chapel Royal, Dublin, in 1866. He was appointed Bishop of Peterborough in 1868, and Archbishop of York in 1891, only a few weeks before he died. Dr. Magee was active in the organization of the Church Defense Society, which was intended to counteract the efforts of the Liberation Society to bring about the disestablishment and disendowment of the Church of England. He was president of the Church congress that met at Leicester in 1880, and from 1880 to 1882 was select preacher to the University of Oxford. He was a frequent contributor to the *Fortnightly Review* and other periodicals, and published *The Gospel and the Age* (1884) and *The Atonement* (1887). A posthumous volume of addresses and speeches, and two sermons were published in 1891-92. Consult his *Life and Correspondence* by Macdonnell (London, 1896).

MAGELLAN, mȧ-jĕl′lan, FERDINAND. The discoverer of the Strait of Magellan. See MAGALHÃES, FERNÃO.

MAGELLAN, STRAIT OF. An irregular winding passage between the Atlantic and the Pacific oceans, separating the islands of Tierra del Fuego from the southern extremity of the South American continent, about latitude 53° south (Map: Chile, D 14). Its extreme length is 370 miles, and its breadth varies from 2½ to 70 miles. It has numerous bays and branches, especially at its southwestern end, where it separates into channels inclosing a number of islands. The scenery along its shores is varied; at the eastern end the land is low and treeless, toward the middle it becomes mountainous and forested, in some places forming lofty precipices. Though the strait is generally free from shoals and other obstructions, its western portion is subject to impetuous currents and to rough and squally weather, rendering the passage unsafe for sailing vessels, which generally pass around Cape Horn. The strait is, however, very convenient for steamers. Its only considerable harbor is Punta Arenas (q.v.). The strait was discovered by Magellan in 1520.

MAGELLANIA, măj′ĕl-lā′nĭ-ȧ (Neo-Lat., from the proper name *Magellan*). A genus of

Brachiopoda of the family Terebratulidæ. See TEREBRATULA.

MAGENDIE, mȧ'zhäɴ'dē', FRANÇOIS (1783-1855). An eminent French physiologist and physician, born at Bordeaux. Through the influence of his father, who practiced as a physician in Paris, he became a pupil of Boyer, the celebrated anatomist. At the age of twenty, after a competitive examination, he was appointed prosector in the faculty of medicine, and soon afterwards a demonstrator. He was subsequently appointed physician to the Hôtel-Dieu. In 1819 he was elected a member of the Academy of Sciences, and in 1831 succeeded Récamier in the chair of anatomy in the College of France.

He was the first to prove experimentally that the veins are organs of absorption; he gave a more accurate account of the process of vomiting than had been previously given; he pointed out that an animal cannot live solely on any one kind of food; he investigated the physiological action and therapeutic uses of hydrocyanic acid and strychnine; he performed an important series of experiments on the cause of death when air is admitted into the larger veins; he made numerous experiments to determine the functions of various nerves and of different parts of the brain; and, lastly, he shares with Sir Charles Bell the honor of having discovered the separate functions of the two roots of the spinal nerves.

Magendie's chief physiological works are: *Précis élémentaire de physiologie* (Paris, 1816), which went through several editions, and was enlarged into the *Eléments de physiologie*, which was translated into English, and was for many years the best work on physiology in this language: *Leçons sur les phénomènes physiques de la vie* (Paris, 1836-42); *Leçons sur le sang* (Paris, 1839); *Leçons sur les fonctions et les maladies du système nerveux* (Paris, 1839); and *Recherches philosophiques et cliniques sur le liquide cephalo-rachidien ou cérébro-spinal* (Paris, 1842). He was likewise the founder and for ten years the editor of the *Journal de la Physiologie Expérimentale*.

MAGENTA, mȧ-jĕn'tȧ. A town in the Province of Milan, Italy, 15 miles west of Milan by rail (Map: Italy, C 2). Its district yields excellent wine and an abundance of mulberries. It is chiefly famous as the scene of the victory by the French and Sardinians over the Austrians on June 4, 1859. The French and Italian troops were nominally commanded by Emperor Napoleon III. and King Victor Emmanuel, but the victory was due to the tactics of General MacMahon (q.v.), who was created Duke of Magenta and marshal of France, Population, in 1901 (of commune), 7974.

MAGERÖ, mä'gȧ-rē̆. An island belonging to Norway, lying close to the coast of Finmarken, in the Arctic Ocean (Map: Norway, L 1). Its dimensions are 20 by 15 miles; it is very irregular in outline, deeply indented by fjords, and consists of a rocky plateau falling abruptly into the sea on all sides. It terminates on the north in North Cape (q.v.), the most northerly point of Europe, which rises almost perpendicularly from the sea to a height of 970 feet. Population, 32,596, mostly Norwegian and Lappish. A few shrubs and grass are found along the streams; lichens and reindeer-moss abound, which support considerable herds of tame reindeer.

MAGGIORE, mȧ-jō̆'rȧ, LAKE. A body of fresh water, of which four-fifths is in the Italian provinces of Novara and Como, the northern fifth in the Swiss Canton of Ticino (Map: Italy, C 1). It is 636 feet above the sea, 37¼ miles long, 6 miles wide between Cerro and Feriolo, with an average width of a little over two miles and an area of 82 square miles. The greatest depth is 1221 feet. It is the longest lake in Italy, though surpassed in area by Lake Garda (q.v.). The river Ticino (q.v.) flows through the length of it from north to south, and the most important of the twenty other streams that feed it are the Maggia from the northwest and the Toce from the west. The north, west, and southwest shores rise into lofty mountains with snow-capped peaks, but the east bank gradually declines to the level of the plains of Lombardy on the southeast. The water in the north of the lake is green, in the south deep blue. As the Saint Gotthard and Saint Bernardino highways meet at Bellinzona, on the Ticino, five miles above the head of the lake, much of the Swiss and German trade with Italy formerly passed via the lake and the roads that parallel it. Steamboats every two or three hours in summer now connect the principal points on the lake (from Locarno to Arona in six hours), and the railroad between Bellinzona and Sesto-Calende, skirting the east shore of the lake, is part of the system connecting Genoa (q.v.) with the north, via the Saint Gotthard Tunnel. The principal places on the lake are Locarno (q.v.), Magadino, and Brissago in Switzerland, and in Italy Cannobio, Maccagno, Luino (q.v.), Laveno, Intra, Pallanza, Baveno, Stresa, Arona (q.v.). Magadino (population, in 1888, 768; in 1900, 800) was once the most important port on upper Lake Maggiore, but the Saint Gotthard railway turned the course of trade in other directions. Brissago (population, in 1901, 572) is picturesque, with villas, gardens, and olive-groves. Cannobio, an ancient town (population of commune in 1881, 2557; in 1901, 3023), has three hotels, markets wine, fruit, grain, cattle, and hides, and manufactures silk and cotton goods. At Lake Eglio, north of Maccagno and 2950 feet above the sea, are an excellent hotel and splendid scenery. Laveno (population of commune in 1901, 1961) is at the mouth of the Boesio, on a bay that was once a fortified harbor for Austrian gunboats. The fortifications were pulled down in 1859, and a monument commemorates the Garibaldians who fell here in that year. A pottery now occupies the site of Fort San Michele; the other chief industry is silk-spinning. Just behind Laveno rises the Sasso del Ferro (3485 feet), while a few miles to the northeast is Mount Nudo (4052 feet). Intra (population of commune in 1901, 6902) has important cotton, glass, and other factories, belonging mostly to Swiss proprietors. Pallanza (population of commune in 1901, 5237) commands a view of the famous Borromean Islands (q.v.), and, being the warmest spot on the lake, is a favorite winter resort for foreigners. Near Baveno (population of commune in 1901, 2502) is a villa occupied by Queen Victoria in the spring of 1879. Breezy and picturesque Stresa (population of commune in 1901, 1491) is the summer home of many of the Italian nobility. From Stresa Mount Mottarone (q.v.) can be ascended.

MAGGOT (probably from Welsh *maceiad*, *macai*, maggot, from *magu*, breed, Corn., Bret.

maga, feed). The footless larva of any true fly. See FLY.

MAGI, mā′jī (Lat. *Magus*, Gk. Μάγος, *Magos*, from OPers. *maγu*, Av. *moγu*, magian, from Assyr. *maḥḥu*, magician, soothsayer). The name of the priestly order in ancient Media and Persia. Originally the designation Magi denoted members of a certain Median tribe, as we know from Herodotus (i. 101); but the religious association of the name seems to have existed from the earliest times. In Persian history the spiritual advisers of the Achæmenian kings are always called Magi, and their Median origin is generally acknowledged. Cyrus the Great was regularly attended by Magian priests; and, if we may believe Xenophon, it was Cyrus who first formally established them, although, as a priestly institution, the Magi must have been in existence before. A festival of the 'slaying of the Magians' was long celebrated by the Persians in commemoration of the overthrow of the False Smerdis, a Magus, by Darius, and so of their not having been forced again to assume the Median yoke. The hatred of the sacerdotal caste evinced in this was probably more political and anti-Median than it was religious or anticlerical. The Median Magi were traditionally the priestly masters of the Persians; it was not lawful for a Persian to sacrifice without one of the Magi, and the power of this sacerdotal body must have been considerable in affairs of state as it was in religion.

There seems every reason to believe that Zoroaster was a Magian, if we may judge from references in Pahlavi literature, in the Greek and Roman writers, and in later Persian tradition. He was born in the very region of Media where the Magi abounded. (See ZOROASTER.) In the *Avesta* (q.v.) the name Magus occurs certainly once in an allusion to a 'hater of the Magi' (*Moγu-tbis*). The Parsis or modern Zoroastrians have kept up the tradition of the name, for the higher order of priests are called *Mobeds*, literally 'Magian Masters.' With regard to their doctrines it may be added that, so far as the Avesta may be presumed to represent the Magian code, and so far as we can judge from Herodotus, Plutarch, and from other writers, the Magi recognized the principle of good and evil, light and darkness, as represented by Ormazd and Ahriman; they believed in a resurrection, a future life, and the advent of a saviour; and in certain peculiar rites and customs, especially the preservation of the elements fire, earth, and water from defilement.

There seems little reason to question that the Magi exercised considerable influence even outside of Media and Persia, or that they were connected or associated with the priesthood of Babylonia and Chaldea. Allusions in the Book of Daniel would imply this; and *Rab-Mag*, in Jeremiah xxxix. 3. may denote the 'Chief of the Magi,' although this interpretation is denied by some scholars. The Magian power was broken by the overthrow of the Persian Empire through Alexander's conquest and the consequent decadence of the Zoroastrian faith. Magism seems to have waned during the darker period of the Parthian sway, although it became paramount again under the Sassanian dynasty. To the condition of the priesthood during the darker period of the Parthians may be ascribed in some measure the evil sense associated with the word Magi by the Romans and by later Greek writers, although it was scornfully used as early as Sophocles—no doubt with an anti-Persian animus. The arts of divination which the Magi must have practiced from the earliest times seem to have brought the word into disrepute as wizard, necromancer, sorcerer, magician. Luke likewise uses it as a sorcerer (Acts xiii. 6). But the term is employed in its true sense by Matthew (ii. 1), of the wise men who came from the East to Jerusalem to worship Christ. The significance of this must be observed because the Messianic doctrine was an old and established one in Zoroastrianism.

MAGIC (Lat. *magice*, from Gk. *μαγική*, *magikē*, magic, sc. *τέχνη*, *technē*, art, from *μαγικός*, *magikos*, magic, from Μάγος, *Magos*, Magian, from OPers. *Magu*, Magian). The art, or pretended art, of controlling occult forces and of producing effects contrary to the known order of nature. This definition, however, is in direct opposition to the original understanding of the art; for primitive peoples conceive nature not as governed by undeviating laws, but as animated by mood and whim, similar to man's, and in its activities normally subject to powers like to his. To the primitive mind the whole natural world is personified and all magic is natural magic. Not that primitive peoples are without the conception of a definite organization of nature; on the contrary, there is hardly a tribe which has not its elaborate cosmology. Indeed (such is the paradox of progress), it may even be said that the theory of the equality of cause and effect, upon which is founded our modern conception of a fixed order in nature, is but a refinement of the principle, fundamental to the great body of magic, that like affects like—that, for example, the red juice of a berry, because it is of the hue of blood, will cure a fever, believed to be a disease of the blood.

Magic with savages is thus the art of the knowledge of nature. It represents to them science and wisdom; and the whole organization of primitive society is ruled by rites and beliefs of magical character. Notably this is the case among the Polynesians, with their elaborate system of tabu, which is really proscription for magical reasons. Tabu determines the age of marriage, the time of planting and harvesting, the open and closed season for fish or game, as well as ceremonial conduct. The organization of savage tribes into cults or societies, practically universal, invariably derives its power from some magical reason, usually associated with totemism (q.v.) and inculcated by barbarous initiations. Everywhere social prerogative and prohibition is governed by magic rule and rite.

A typical philosophy of magical beliefs is set forth by Hewitt, a cultivated Iroquois. The Iroquois believe that the motive underlying all effort is desire for welfare, to secure which men often struggle against adverse environment. All things and phenomena—the sun and the stars, the rocks, the tides, the trees, as well as plants, animals, and men—have life and personality. All think, feel, will, do good and harm; each striving for its own welfare. All these personalities operate through a primitive power which the Iroquois call *orenda*. This power is not wholly under the control of its possessor; it may even act adversely to his welfare; but it is under the control or influence of seers and men of wisdom.

Thus a shaman is a man of mighty *orenda;* when a hunter slays, his *orenda* baffles that of the game. *Orenda* may be stored in charms, amulets, medicines; and in the forms and colors of all things there are magic properties (*orenda*) which the observant person notices, and gaining knowledge thereof becomes a seer.

It is manifest that here we have a theory in which religious elements (philosophy of life) and natural magic are intimately commingled; and, indeed, such is usually the case with primitive peoples. At the same time, the relation of early magic to religion is a matter of some disagreement. On the one hand, it is held that magic and magical practices precede the development of religious conceptions, or mythologies, which arise later as allegorical interpretations; on the other hand, magic is taken to be a degenerate and perverted form of religious practice. Both theories have justification. The great body of primitive magic is the so-called sympathetic magic based upon the idea that like affects like, and is not to be discriminated from fetishism and other elemental forms of worship. A superstition as widespread as the human race and as ancient as its records leads to the fashioning of images of enemies for the sake of mutilating them in the belief that these enemies will suffer like mutilation. In Europe in the Middle Ages waxen images were melted before a fire and it was supposed that the person represented would similarly waste away. Savage fetishism carries this principle to the extreme, any trifle which has once been possessed by a man being esteemed ever after to retain a potent influence over him; thus it is related of a South Sea island king that he offered the greater part of his property for the return of a lock of his hair stolen by his enemies. Such is the theory of early magic, and it is evident that the same theory persists when the Chinese sticks nails into an idol recalcitrant to his prayers, although with him it is conceived to be a superhuman spirit that suffers, not another man. Indeed, the use of images in all religious worship must have acquired its first meaning from the idea of a magical sympathy or rapport. Nevertheless, among the most primitive peoples mythology seems to be preserved in distinction from magic, and even if the conception of worship did arise from the latter it is not clear how the idea of divinities could have done so. Moreover, we have many evidences of religions degenerating into demonological superstition, with belief in magical control, and this might give a fair account of the whole evolution.

Historically, however, there is no evidence as to which had precedence. In the most ancient times both Egypt and Mesopotamia had developed, together with complex mythologies, elaborate systems of magical practice. All such practices fall into three main divisions: Sympathetic magic, including most that passes for witchcraft, sorcery, enchantment, and healing magic; divination, including astrology, clairvoyance, necromancy, and the many forms of the reading of signs; and wonder-working, or thaumaturgy—jugglery, enchantment and demon control, miracles. From remote times all of these forms were present, but in general the Persian and Medean Magi appear to have excelled in the first, as did the Chaldæans in astrology and the Egyptians in thaumaturgy. In each country, as is the case among savages, the magician was also physician and priest. The practice of magic was primarily religious, but it also embodied whatever scientific knowledge the age possessed. Thus, especially in magic aimed to cure disease, there were many rites and ceremonies to be performed, all thought to be of a religious nature, but often including the administration of a healing drug or other beneficial treatment. At the same time there were formulæ for exorcising the demon of disease, which priest as well as layman rigidly believed to be essential to the cure. On the other hand, there were many deceptive tricks, especially among the Egyptians and classic peoples, made possible by the possession of rudimentary knowledge of physics and chemistry or by legerdemain and other forms of juggling. Such were the apparitions of gods and demons produced by the use of concave mirrors; such were the speaking statues and many of the oracles; such, very likely, the tricks of the priests who measured arms with Moses and Aaron before Pharaoh.

Both in Egypt and Mesopotamia the purposes of magic were as manifold as the happenings of human life. In Egypt have been discovered hundreds of magical recipes ranging from invocations of divinities and lures for happiness, friends and fortune, to spells for causing gold to rust, for separating man and wife, and for murdering by occasioning sleepless nights until the victim dies. Indeed, the Egyptians were not content to limit their magic to this world; the famous "Ritual of the Dead" is a series of incantations supposed to carry the soul safely through the perils of under-world journeying.

Chaldæan incantations abound in passages showing the many kinds of baneful magic feared by the Mesopotamians, which the incantations were designed, of course, to ward off. These are often long and monotonously exact enumerations, it being essential that the language of the spell should leave no loophole for unincluded ills or demons. Thus: "The wizard has charmed me with the charm, has charmed me with his charm; the witch has charmed me with the charm, has charmed me with her charm; the sorcerer has bewitched me with the spell, has bewitched me with his spell; the sorceress has bewitched me with the spell, has bewitched me with her spell; he who enchants images has charmed away my life by an image; he has taken the enchanted philter, and has soiled my life with it, he has torn my garment and dragged it in the dust of my feet. May the god Fire, the hèro, dispel their enchantments." (Lenormant.)

Amulets and talismans were used in great profusion by all ancient peoples, sometimes carved in the form of protecting divinities, sometimes engraved with magical inscriptions, and usually ceremonially prepared according to minute specifications. They were either of general value, as when wearing of a magic ring procured prosperity; or of specific usefulness, as when an image of a certain demon was applied to a part of the body, supposed to be suffering from that demon, to effect a cure. Frequently they were designed as protection from the evil eye, which all ancient peoples believed to be peculiarly sinister, and for this purpose they were often made in imitation of eyes. Especially in later antiquity certain semi-scientific designs were conceived to possess magical powers. Thus the pentagram, probably adopted first by the Pythagoreans as a sign of fellowship and to commemorate its discovery, afterwards became a popular talismanic figure, persisting throughout the Middle Ages. Magic squares (q.v.) were similarly used. From very ancient times archaic or foreign names of deities were thought to confer power over these deities upon the possessor of them—probably a persistence of common superstition of savages that a stranger's knowledge of their own names will subject them to his power. Such names were frequent in incantations and often placed upon charms. Other words were chosen for mystical reasons, as Abraxas, Abracadabra (qq.v.).

The classic peoples added little that was original to the vast body of Oriental magic which, for the most part, they readily assimilated. To be sure, classical polytheism was from the beginning permeated with magical rites and practices, but the mythological and intellectual element was relatively stronger than in the East; their polytheism was a hero worship rather than a demon or spirit worship. Nevertheless in Greece many magical cults were adopted from Asia and one at least—the cult of Hecate—appears to have been native, and to have left us as its legacy our many superstitions in connection with the moon, which that goddess impersonated as patroness of sorcerers. The Greeks, too, in their myths emphasized forms of enchantment resulting in metamorphosis—for example, Circe—thus giving to the art an imaginative prestige quite foreign to the more primitive superstitions of the East. Again, even where it could not overthrow magical belief, Western philosophy raised this belief to something resembling scientific form. Thus the semi-mystical metaphysic of the Pythagoreans, who found the essential nature of all things in numerical relations, which, lending itself readily to magical interpretations, resulted in a magic which seemed to those who held it only an enlightened philosophy of nature, and doubtless was an advance over current mythological conceptions. The science of astrology (q.v.), which both Egyptians and Chaldæans had elaborated, was accompanied by no small real knowledge of the stars, and it was further rationalized by a physical theory of elements. These elements or 'humors' were four: two creative and nourishing, heat and moisture; and two unhealthy and destructive, cold and dryness. The different planets were supposed to dominate one or more of these elements and through these to produce their effects. Granting the premises, astrology was thus a true science. Later the Neo-Platonists and the Gnostics developed elaborate systems of magic, throughout in accord with carefully wrought theories of the universe.

Rome, though from the earliest time possessing characteristic forms of divination and official diviners or augurs to foretell public dooms, added even less than Greece to the positive development of magic. There were many dark practices developed in the local Italian cults, conjuration of lemures, exorcism of larvæ, and other demonological superstitions, to which without question the older Etruscan civilization contributed much; but the indigenous magic of Italy was of little importance compared with the assimilation of foreign beliefs in Imperial Rome. The city became the resort of magicians of every type and from every land, absorbing that multiplicity of superstitions which was to form a part of Western Europe's heritage of Roman civilization. It is true that in both Greece and Rome a few of the more enlightened minds rejected magic as pernicious nonsense, and in this, as in a certain amount of proscriptive legislation, is evinced the intellectual advance of the classic peoples; but the enlightenment signified nothing for the mass of the people nor for the social organization. Magic was an integral part of their paganism and could not be eliminated until the pagan order should come to an end.

To understand the attitude of Christianity toward magic and its long struggle against magic arts, it is necessary to bear in mind the fundamental distinction between good and bad magic. Even the most primitive savages discriminate helpful and harmful magic, though with them the distinction is not in the kind of magic *per se*, but in its use. Thus, bad magic or 'medicine' is that which bewitches or injures one's self; if it injures one's enemies it is good. Similarly, the fetish which protects one from the machinations of an enemy is good, though if he use the like means for his own defense it is bad. This distinction naturally gave rise to the more abstract theory that magic capable of inflicting injury is controlled by malevolent spirits, while magic which protects or heals is controlled by beneficent spirits. It was under the latter form that the Oriental and pagan beliefs of antiquity were organized, and in Egypt as well as in Greece and Rome, even though the State itself sanctioned the rites of beneficent magic, the use of malevolent magic (the aid of demons) was early proscribed by law. To the Christian Fathers, however, all pagan deities were conceived as demons (and few of them doubted the power of these demons), and hence the overthrow of paganism logically involved the destruction of all magic. By the very attitude of Christianity it all became malevolent magic—the black art.

Unfortunately, magical beliefs were too thoroughly ingrained in human nature to be readily eradicated, and persisting in spite of the opposition of the Christian religion during the Middle Ages, it remained as a confused element in much of the mediæval learning. There appear to be three predominant strains in the mediæval development. In its results the most important is that which gave rise to modern science. As already indicated, scientific elements were present in ancient magic, most notably in astrology and healing magic, which formed true if imperfect sciences. In mediæval times alchemy (q.v.) became even more important; and, indeed, the chief business of the mediæval magician was to find the secret of the 'philosopher's stone,' which should transmute base metals into gold, and the elixir of life, which should bestow eternal youth. It also embodied certain forms of physical experimentation, notably by Albertus; and eventually gave rise to the modern white or natural magic. See LEGERDEMAIN.

The black magic of mediæval times derived its main source from that peculiarity of Oriental magic which laid stress upon the use of esoteric names of deities. This is manifestly a survival of the savage superstition which impels the substitution of nicknames for real names; but it is a superstition augmenting with the age of traditions and is possible in extreme form only to peoples who build upon abandoned cultures. For example, the Assyrians attached importance to the recitation of Accadian incantations or their inscription in Accadian characters; and very many of the patron divinities of ancient sorcery were deities of decaying or imported cults. In antiquity there were two main types of this magic of names, a Semitic and an Egyptian. Iamblichus, early in the fourth century, noted that the invocations of Chaldæan magicians were addressed to gods and always assumed the form of a supplication, whereas the Egyptians addressed their incantations to demons or lesser divinities, couched them in mandatory language, and frequently accompanied them with threats. The Egyptians did this because of their superstition that knowledge of esoteric names gave control of spirit. The Chaldæans, while they believed that there is a name which could it be known would control the highest of the gods, held that knowledge of it is possessed by only one deity. This belief persists among Mohammedan sorcerers to-day, the supreme spell being pronounced "in the great and unknown name of Allah." In Europe, however, the Egyptian type prevailed, and the black art of mediæval magicians consisted largely in a supposed control of demons by means of occult names. Often, however, the names of Jehovah and the Christian saints were used to command evil spirits, being supposed to inflict torment upon the demons and to serve as scourges by means of which the magician could control them. Connected with this use of names were all sorts of symbolical practices, assuming the likeness of Christian or pagan worship. See SATANISM.

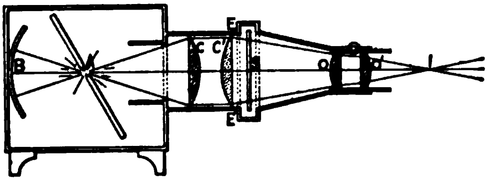
The third element in mediæval magic came from Northern Europe, from Druid and Teutonic sources. It assumed the form of clairvoyance, or feysightedness; thence divination by seers and various forms of enchantment. In principle it differs from the Oriental type in that the magician is conceived to attain power less by control of demons than as a personal possession: the magician becomes a witch, able to blast by a glance or a touch, as well as able to cure disease and to foresee the future by clairvoyance. Witchcraft was intimately associated with diabolism, but appears rather as the magic of the lower classes of Western Europe, to whom occult lore was sealed. It was also peculiar in that the vast majority of witches were women or girls; a fact which seems to hark back to the function of the seeress in pre-Christian ages. It may therefore be considered the native magic of Western Europe. Like the art of the educated magician, it was proscribed by the Church, and perhaps because of numbers, perhaps because of greater hold upon the people, was subjected to cruel persecutions by Protestants and Catholics alike, thousands of 'witches' being burned, hanged, and strangled during the fifteenth, sixteenth, and seventeenth centuries. See WITCHCRAFT.

With the Renaissance, magic in its ancient sense practically disappears from Europe. Not that superstitious beliefs, charms, divinations, and spells then came to an end or have even yet come to an end; but in the struggle with Christianity magic had ceased to be an institution of the social organism. Among savages it is of the utmost importance, the chief sanction of society and intimately interbound with religion. In the civilized nations of antiquity the political organization of the State became very largely freed from its control, but religion and a large measure of the social life of the people still rested upon the basis of magical belief. Christianity appeared as the natural opponent of this belief, and in the long struggle practically eradicated magic as an element of religion or learning and so prepared the way for modern science.

Consult: Maury, *La magie et l'astrologie* (4th ed., Paris, 1877); Lehmann, *Aberglaube und Zauberei von den ältesten Zeiten an bis in die Gegenwart* (Stuttgart, 1898); Hellwald, *Zauberei und Magie* (Ulm, 1901); Ennemoser, *Geschichte der Magie* (English trans., Bohn's Library); Michelet, *La sorcière* (Paris, 1862); Frazer, *The Golden Bough* (enl. ed., London, 1900); Lang, *Magic and Religion* (London, 1901); Elworthy, *The Evil Eye* (London, 1895); Lenormant, *Chaldæan Magic* (London, 1877).

MAGICIAN OF THE NORTH. A name applied to Sir Walter Scott. It was also used by Johann Georg Hamann of himself.

MAGIC LANTERN. An optical instrument by means of which magnified images of small transparent pictures can be thrown upon a white wall or screen in a darkened room. It consists of some powerful source of illumination such as an oxyhydrogen or electric light, though in a small hall or room and with an instrument of limited power it is possible to employ an Argand or incandescent gas burner, or an acetylene or oil lamp, which is contained in a box of wood or sheet metal. The rays from the illuminant fall upon a lens known as a condenser, which is either a thick convex lens, or, better, two plano-convex lenses with their curved surfaces in close proximity, and whose function is to collect the rays, and transmitting them in either a parallel or slightly converging beam to illuminate the slide, as the transparent picture on glass is termed. The slide is usually a transparent photographic positive, or a drawing or painting on glass, and is inserted in an inverted position in a frame in front of the condenser. To produce an image of the picture, another lens or system of lenses known as the objective is used, which must be achromatic and free from distortion, so as to form an image with a flat field. By varying the distance between the slide and the objective, the image on the screen is brought to a focus, and in modern instruments great magnification and sharpness are secured. Many improvements have been made in the magic lantern, and it now is considered a necessary adjunct to lectures and scientific demonstrations, as, in addition to the presentation of photographs and diagrams, numerous experiments in physical science can be shown on such a scale as to be visible to a large audience. There are also arrangements known as anematographs, vitascopes, biographs, kinetoscopes, etc. (see KINETOSCOPE), whereby moving pictures can be shown in the magic lantern by using in place of a slide a rapidly mov-



MAGIC LANTERN.

A, electric arc inclined so as to have the crater of the arc at the focus of the condenser; B, reflector; C, C′, lenses of condenser; E, E′, mounting for lenses; S, slide; O, O′, projecting lens or objective point; I, where rays cross.

ing film, on which have been photographed a series of pictures taken in quick succession. As the successive images follow each other on the screen more rapidly than the eye is able to receive the separate and distinct impressions, they accordingly blend into each other and the effect of moving pictures is produced.

MAGIC MIRROR OF JAPAN. A few of the small, round mirrors used by the Japanese have the property of reflecting light to a screen or other surface so as to form images corresponding to the ornamental designs on their backs. As these mirrors do not differ in appearance from those that do not furnish such images, they have been termed magic mirrors, and their peculiar property furnished an interesting problem to scientists for a number of years. The Japanese hand mirrors in general are made of bronze, more or less convex on their reflecting side, with a polished surface of mercurial amalgam, and have on their back ornamented figures, such as flowers, dragons, and similar patterns. Professors Ayrton and Perry ascertained that there were certain portions of the reflecting surfaces corresponding to the designs on the back, which were more worn away in the course of polishing and thus became concave, or at least less convex than the rest of the surface. This circumstance, which results from a mere accident in the process of manufacture, served to explain the formation of the bright images on a dark ground when the mirror was used to reflect light to a surface. The magic mirrors, which are extremely valuable, have been produced in England by following this principle. See Thompson, *Light Visible and Invisible* (New York, 1897); and *Proceedings of the Royal Society of London*, vol. xxviii. (London, 1879).

MÁGICO PRODIGIOSO, mȧ′hĭ-kō prō′dĭ-hĭ-ō′sō, El. One of the most striking plays of Calderon. The theme is the contest between good and evil. Cypriano is tempted by Satan, the reward being the possession of a woman. But when the prize is finally delivered to him it turns into a skeleton in Cypriano's arms.

MAGIC SQUARE. A term applied to square arrays of numbers possessing the property that the sums of the various columns and rows, and of the two diagonals, are equal. In Fig. 1 this sum is 34. This square (the earliest known in Europe) was represented in Dürer's copperplate entitled *Melancholia.* The origin of magic squares is generally ascribed to India, although without any strict proof. A magic square is found on one of the gates of the fortifications, in the Sanskrit characters, in the East Indian city of Gwaloir, but its antiquity is not such as to justify the assumption of Hindu origin. Magic squares were, however, certainly known to the Arab astrologers, who claimed for them a peculiar supernatural power and recommended them as talismans and amulets. A similar power is attributed to them to-day among the Hindus and to some extent in Europe.

1	14	15	4
12	7	6	9
8	11	10	5
13	2	3	16

Fig. 1.

There are various methods for constructing magic squares of an odd number of cells. One of the oldest of which we have any knowledge is described by De la Loubère in his work *Du royaume de Siam* (1691), and by him ascribed to the Hindus of Surat. The rule is as follows: Write 1 in the middle cell of the top row, 2 in the first cell to the right of the middle of the bottom row, then following the diagonal to the right until the right hand margin is reached; then go to the row above and take the left-hand cell, and again follow the diagonal upward to the right, and when the upper margin is reached, go to the lowest row and one cell to the right. If progress is barred by a filled cell, go one cell down from the last number written and proceed as before. (See Fig. 2.) Another well-known method for an odd number of cells, due to Bachet de Méziriac (see Bachet), is as follows: Take, for example, 25 cells. Arrange and number them as in Fig. 3. Then slide the outside cells to the sides opposite those on which they rest, thus filling all cells, as Fig. 4.

17	24	1	8	15
23	5	7	14	16
4	6	13	20	22
10	12	19	21	3
11	18	25	2	9

Fig. 2.

				5				
			4		10			
		3		9		15		
	2		8		14		20	
1		7		13		19		25
	6		12		18		24	
		11		17		23		
			16		22			
				21				

Fig. 3.

It is not so simple to construct magic squares with even numbers of cells. The following method is, however, not particularly difficult. Suppose the cells are filled, in the first place, with the numbers arranged in the natural order, as in Fig. 5.

3	16	9	22	15
20	8	21	14	2
7	25	13	1	19
24	12	5	18	6
11	4	17	10	23

Fig. 4.

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Fig. 5.

It will be observed that the diagonals are already magic, since each equals the constant sum $\frac{n}{2}(n^2+1)$. It therefore only becomes necessary to arrange the rows and the columns to meet the definition. In the rows, the sum of the numbers in the kth from the top is $\frac{n}{2}(n^2+1)-\frac{n^2}{2}(n-2k+1)$, and the sum in the kth from the bottom is $\frac{n}{2}(n^2+1)+\frac{n^2}{2}(n-2k+1)$. Furthermore, the number in each cell of the kth row from the top is less than the number in the corresponding cell in the kth from the bottom by $n(n-2k+1)$. Hence, if in these two rows we make $\frac{n}{2}$ interchanges of the numbers in corresponding cells, we increase the numbers in the kth row from the top, and decrease those in the kth from the bottom, by $\frac{n}{2}\cdot n(n-2k+1)$, and therefore make each of these rows magic. But in doing this it is, of course, necessary to leave the sum of the diagonals unchanged. It next becomes necessary to consider the columns. The procedure here is much the same as in the case of the rows. The sum of the numbers in the kth column from the left was originally equal to

$$\frac{n}{2}(n^2+1)-\frac{n}{2}(n-2k+1),$$

while in the kth column from the right it was

$$\frac{n}{2}(n^2+1)+\frac{n}{2}(n-2k+1).$$

The number in each cell of the kth column from the left was originally less than the corresponding number of the kth column from the right by $n-2k+1$. Hence $\frac{n}{2}$ interchanges are necessary as before, care being taken as to the diagonals. The difficulty comes in making the double interchange without disturbing the sums of the diagonals, but it can be shown that this interchange is always possible if $n>2$. Starting with the initial square, the changes for a 4^2 square are shown as follows:

1	14	15	4
9	6	7	12
5	10	11	8
13	2	3	16

FIG. 6.

1	15	14	4
12	6	7	9
8	10	11	5
13	3	2	16

FIG. 7.

Besides magic squares, magic polygons and solids of various forms have been studied.

BIBLIOGRAPHY. On the history of the subject, consult: Günther, *Vermischte Untersuchungen zur Geschichte der mathematischen Wissenschaften* (Leipzig, 1876); Lucas, *Récréations mathématiques* (Paris, 4 vols., 2d ed., 1891-94); McClintock, "On the Most Perfect Form of Magic Squares," in the *American Journal of Mathematics* (1897); Horner, "On the Algebra of Magic Squares," in the *Quarterly Journal of Mathematics* (1870); Scheffler, *Die magischen Figuren* (Leipzig, 1882); Ball, "Even Magic Squares," in the *Messenger of Mathematics* (London, 1894); Ball, *Mathematical Recreations* (London, 1892); Ahrens, *Mathematische Unterhaltungen und Spiele*, giving a very complete bibliography (Leipzig, 1901); Schubert, *Mathematische Mussestunden* (Leipzig, 3 vols., 2d ed., 1900).

MAGIE, mȧ-gē′, WILLIAM FRANCIS (1858—). An American physicist, born at Elizabeth, N. J. He graduated at Princeton University in 1879, and was appointed professor of physics there in 1885. His papers on the contact angle of liquids and solids and on the specific heats of solutions are noteworthy. His principal books are: A revision of Anthony and Brackett's *Physics* (1896), a translation of Christiansen's *Theoretical Physics* (1896), and an edition of *Papers on Thermodynamics* (*Harper's Scientific Memoirs*, 1899).

MAGINN, mȧ-gĭn′, WILLIAM (1793-1842). An Irish author, born in Cork. He graduated at Trinity College, Dublin, in 1811. From 1813 to 1823 he conducted a school at Cork, and beginning in 1819 with the doggerel-Latin version of *Chevy Chase*, for nine years contributed to *Blackwood's Magazine* a series of clever articles. In 1823 he went to London, where he was employed by Murray as European correspondent of the daily *Representative*. On his return to England he was for a time joint editor of the *Standard*, and in 1830 assisted in establishing *Fraser's Magazine*. In this periodical first appeared his inimitable *Gallery of Literary Characters*, with excellent accompanying sketches by Maclise. In 1836 his attack on a novel by Grantley Berkeley occasioned an innocuous duel. The three essays on *The Learning of Shakespeare* (1837) and the *Homeric Ballads* (1838), versifications of portions of the *Odyssey*, display something of his real scholarship. Brought by intemperance and debt to the Fleet, where he dwelt even as Thackeray's "Captain Shandon" shows him, the one-time wit emerged thence, through the good offices of Sir Robert Peel, to die in extreme poverty. A collection of his writings was published in 1855-57 (New York, 5 vols., edited by R. S. Mackenzie).

MAGISTER′ SA′CRI PALATII, pȧ-lā′shĭ-ī Lat., master of the sacred palace). An officer of the Papal Court. It is said that Saint Dominic while in Rome noticed that the servants of the cardinals were compelled to pass much time in idleness hanging around the doors of the Vatican while their masters were in audience. So he received permission to read the Scriptures to these people. When he went away another was appointed to succeed him in this labor. Out of this practice arose the present office, which is a very important one, as the incumbent is the censor of all books and pamphlets published by Catholics in Rome, a member of the congregations of the Index, the Inquisition and Rites, and has the right to grant the degree of doctor in theology and philosophy. He is always a member of the Dominican Order.

MAGISTRATE (OF., Fr. *magistrat*, from Lat. *magistratus*, magistrate, *magister*, master; connected with *magnus*, Gk. *μέγας*, *megas*, Skt.

mahant, AS. *micel*, OHG. *mihhil*, great). In its broadest sense a person clothed with power as a public officer. Blackstone employs it in this sense. Stating that the supreme magistracy was divided between King and Parliament, and discussing the powers of each, he proceeds to describe the subordinate magistrates of the most general use and authority, which, he tells us, "are principally sheriffs, coroners, justices of the peace, constables, surveyors of highways, and overseers of the poor." Besides these are various other magistrates whose history, powers, and duties he does not pause to consider. In this generic sense the term is used in the Declaration of Rights of Virginia, Massachusetts, and other States. One of these runs as follows: "That all power is vested in and consequently derived from the people; that magistrates are their trustees and servants, and at all times amenable to them." The writers of the *Federalist* gave this broad signification to the word when they designated the proposed President of the United States as the chief magistrate of the Union, and compared his powers and duties with those of the governors or chief magistrates of the various commonwealths.

At present, the term is rarely employed in legal parlance in its generic sense, except in connection with the office of President or of Governor. In England, it appears to be confined to ordinary justices of the peace (q.v.), who are appointed by the Crown through the Lord Chancellor, and serve without pay, and to the stipendiary or police magistrates, who are appointed by the Crown on the nomination of the Home Secretary, and receive salaries fixed by local boards, subject to the approval of one of the principal secretaries of State. The courts held by these officers, although technically described as petty sessions, special sessions, and quarter sessions, are popularly known as Magistrates' Courts. Stipendiary magistrates must be barristers of at least seven years' standing.

In this country, the meaning of magistrate, as a statutory term, has been frequently considered by the courts. While these decisions are not altogether harmonious, the prevailing view is that the term is to be understood in the narrow sense, now attaching to it in England, of "an inferior judicial officer, such as a justice of the peace." Occasionally, statutes define it with much precision. See Shirley, *An Elementary Treatise on Magisterial Law* (London, 1896); Dugan, *Law and Practice for Justices of the Peace and Police Justices* (Albany, 1901).

MAGLIABECHI, mä'lyȧ-bĕk'ē, ANTONIO DA MARCO (1633-1714). An Italian scholar and bibliographer, born at Florence. For forty years he was a goldsmith. From his earliest years, however, he displayed an inordinate passion for the acquisition of book knowledge, and, having mastered the Greek, Latin, and Hebrew languages, literally buried himself among books, disorderly piles of which incumbered every portion of his dwelling. In his daily habits he grew to disregard the requirements of social and sanitary life; and such was his avidity of study that he finally denied himself even the requisite intervals of repose. His memory was prodigious. Regarded as the literary prodigy of his times, he was appointed Court librarian by Cosimo III., Grand Duke of Tuscany, and many tributes of respect were tendered him by royal and distinguished personages. He was intolerant of literary merit in others, was involved in several bitter literary squabbles, and died leaving, outside of his correspondence (edited by Targioni, Florence, 1745), no written record of his encyclopædic knowledge. His library of 30,000 volumes he bequeathed to his native city of Florence, where it now forms part of the National Library. Consult Salvini, *Orazione funerale in lode di Antonio Magliabechi* (Florence, 1715).

MAG'NA CHARTA, kär'tȧ, or GREAT CHARTER. The famous document granted by King John of England to the barons in 1215, and viewed by after ages as the basis of English liberties. The oppressions and exactions of a tyrannical sovereign called into existence a confederacy of the barons, or tenants-in-chief, of the Crown, who took up arms for the redress of their grievances. Their demands were based on the charter voluntarily granted by Henry I. at his accession in 1100, but added to this was a long list of demands for the removal of royal abuses or exactions which had come into existence since that time, or which had not been mentioned in that document. After several interchanges of messages a conference between the sovereign and the barons was held at Runnymede, near Windsor. King and barons encamped opposite each other; and after several days' debate John signed and sealed the charter with great solemnity on June 15, 1215. See ENGLAND; JOHN.

The Great Charter reared up a barrier against the abuse of the royal prerogative by a series of provisions for the protection of the rights and obligations of the feudal proprietor. It redressed a variety of grievances connected with feudal tenures, some of them now so long obsolete as to be with difficulty intelligible. There are minute provisions regarding the relief of heirs, wardship and marriage of heirs and heiresses, and marriage of the widows of tenants-in-chief. No scutage or aid is to be imposed without the authority of the common council of the Kingdom, except on the three great feudal occasions, of the King's captivity, the knighting of his eldest son, and the marriage of his eldest daughter. The liberties of the city of London and of other towns, boroughs, and ports are declared inviolable. Freedom of commerce is guaranteed to foreign merchants. Justice is no longer to be sold, denied, or delayed. The Court of Common Pleas, instead of, as formerly, following the King's person in all his progresses, is to be permanently fixed at Westminster; assizes are to be held in the several counties, and annual circuits are established. Regulations are made for the efficiency of the inferior courts of justice. The protection of life, liberty, and property from arbitrary spoliations is the most important feature of the charter. "No freeman shall be taken or imprisoned, or be disseized of his freehold, or liberties or free customs, or be otherwise damaged, nor will we pass upon him nor send upon him, but by lawful judgment of his peers, or by the law of the land"—a provision which recognized a popular tribunal as a check on the official judges, and may be looked on as the foundation of the writ of habeas corpus. No one is to be indicted on rumors or suspicion, but only on the evidence of witnesses. Protection is afforded against excessive amercements, illegal distresses, and various processes for debts and services due to the Crown. The fines imposed are in all cases to be proportioned to the magnitude of the offense, and even the villein or rustic is not to be deprived of his necessary chattels. There are provisions regarding the forfeiture of lands for felony. Abuses connected with the royal forests were abolished by several provisions which were of so great importance as to lead to an incorrect statement by contemporary writers that a separate forest charter was granted. The independence of the Church is also provided for.

These are the most important features of that charter which occupies so conspicuous a place in history, and which establishes the supremacy of the law of England over the will of the monarch. From a distinctly constitutional point of view, however, the great importance of Magna Charta lay in its preserving the feudal idea of a contract between lord and vassals, between king and subjects, through the period of personal monarchy which was then already superseding the earlier Norman feudal monarchy, and thus making the development of the later parliamentary restrictions easy and natural.

The terms dictated by the barons to John included the surrender of London to their charge, and the Tower to the custody of the primate till August 15th following, or till the execution of the several articles of the Great Charter. Twenty-five barons, as conservators of the public liberties, were invested with extraordinary authority which empowered them to make war against the sovereign in case of his violation of the charter. Several solemn ratifications were required by the barons from Henry III. and later rulers, and a copy of the Great Charter was sent to every cathedral and ordered to be read publicly twice a year. The copy preserved in Lincoln Cathedral is regarded as the most accurate and complete. The Great Charter and charter of the forests as issued in the reign of Henry III. are printed with English translations, and prefixed to the edition of the statutes of the realm published by the Record Commission. Consult: Thomson, *An Historical Essay on the Magna Charta of King John* (London, 1829); Bémont, *Chartes des libertés anglaises, 1100-1305* (Paris, 1892); Stubbs, *Constitutional History of England*, vol. i., 6th ed. (Oxford, 1897), and vol. ii., 4th ed. (1896).

MAG'NA GRÆ'CIA (Lat., great Greece, Gk. *ἡ μεγάλη* Ἑλλάς, *hē megalē Hellas*). The name given in ancient times to that part of Southern Italy which was thickly planted with Greek colonies. The origin of the name is uncertain, though it has been plausibly conjectured that it was given by the Achæan colonists in remembrance of their former home in the little district which originally was called *Hellas*. The language of Polybius, in whose writings the term first occurs, implies that it was believed to have been in use as early as the sixth century B.C. Some later writers include under the term the Greek cities in Sicily; others restrict it to those situated on the Gulf of Tarentum, but in general it is used to denote all the Greek cities in the south of Italy, exclusive of those in Sicily. The oldest settlement is believed to have been Cumæ—though it is doubtful whether it and its colonies, Dicæarchia and Neapolis, were really embraced under the designation Magna Græcia—which must have been founded near the end of the eighth century. The Greek colonization of Southern Italy seems to have begun a little later than that of Sicily, but the dates commonly given must not be considered as more than approximate. The earliest settlement, not reckoning Cumæ, was said to be Sybaris (founded by the Achæans, B.C. 721); next, Croton (by the Achæans, B.C. 710); then Tarentum (probably by Laconian Dorians; the traditional date B.C. 707 is wholly uncertain); Locri (by the Locrians about B.C. 685); Rhegium (by the Chalcidians; date of origin not known, but believed by some to be older than even Sybaris); Metapontum (by the Achæans, B.C. 700-680); and Siris (by Ionians from Colophon, about B.C. 650; it seems to have been seized later by the Achæan colonies near by). Later Thurii was founded in B.C. 443 by Greeks from many cities under the leadership of Athens. These cities became, in their turn, the parents of many others.

Of the earlier history of Magna Græcia we know almost nothing. It is noticeable that while the Sicilian cities were on the coast and essentially mercantile, the Italian Greeks pushed into the fertile plains of the interior, subdued the native tribes, and developed as great agricultural communities, with a land-owning aristocracy. Not that trade was neglected, for with the great development of these cities during the seventh and especially the sixth century, they carried on an active commerce with the Greeks of the east, the Etruscans of the north, and the native races of the interior, exporting grain and other natural products, and importing the manufactures of Asia Minor and Hellas. The region was also the seat of an active intellectual life. Pythagoreanism developed in Croton, and for a time exercised a powerful influence on the political life of that city. The Orphic theology seems also to have found here a favorable soil for its growth, and at Elea the philosophers Xenophanes and Parmenides founded the Eleatic school. The cities never formed a permanent union, though from time to time we find several joined in temporary alliance. On the contrary, the wars between them were often bitter and bloody, and contributed largely to the decline of the whole region. In the fourth century B.C. the tribes of the north began to press hard on the border cities, especially the Samnites and Lucanians, while at the same time Dionysius of Syracuse endeavored to make his influence supreme. From this time the history is simply a record of endeavors of one or another city to keep back the rising tide of invasion, often by calling in the aid of foreign leaders. The most famous example is the alliance between the Tarentines and Pyrrhus of Epirus against Rome. The failure of this effort led to the capture of Tarentum in B.C. 272, and after that the Roman influence in the peninsula was supreme. The Second Punic War, when the presence of Hannibal induced most of the Greek cities again to seek their independence, completed the ruin of the region, and the cities rapidly sank into decay. Consult Lenormant, *La Grande-Grèce* (Paris, 1881-84).

MAG'NA MA'TER (Lat., Great Mother). A name under which the Græco-Oriental goddess Cybele (q.v.) was worshiped at Rome. A sacred black stone was solemnly brought from Pessinus in Phrygia in B.C. 204, and a temple was built for it on the Palatine Hill, where its remains still exist. The festival of the goddess, the *Megalesia*, fell in April.

MAGNAN, mä'nyäɴ', Bernard Pierre (1791-1865). A French marshal, born in Paris. He entered the army in 1809 and served under Napoleon till the defeat at Waterloo. He was colonel in the army which invaded Spain in 1823, and went to Algeria in 1830. Censured for lack of energy in dealing with an insurrection in Lyons in 1831, he entered the service of Belgium as general of brigade, but in 1839 returned to France, and was implicated in the first attempt of Louis Napoleon at Boulogne. (See Napoleon III.) In 1848 he tendered his services to Louis Philippe, but later sided with the Republicans and was energetic in bringing the Army of the Alps to Paris in June of that year to repress a formidable insurrection under the Republic, and another at Lyons in 1849. He allied himself with Louis Napoleon when the latter became President of France, and as head of the Army of Paris was his efficient instrument in the coup d'état of December 2, 1851. Napoleon made him Senator and marshal.

MAGNAN, Valentin (1835—). A French physician, born at Perpignan. He graduated in medicine at Paris in 1866, and the following year was made doctor at the Saint Anne Asylum in that city. From the outset of his career he devoted himself to the study of mental disorders, and he wrote a number of technical works, especially upon alcoholism, one of which was crowned by the Academy of Medicine (1874). His publications include: *Etude expérimentale et clinique sur l'alcoolisme* (1871); *Etude clinique sur la paralysie générale* (1873); *Des diverses formes de délire alcoolique et de leur traitement* (1873); *Recherches sur les centres nerveux* (1876); *Leçons cliniques sur l'épilepsie* (1882); and *Leçons cliniques sur les maladies mentales* (1887).

MAGNARD, mȧ'nyär', Francis (1837-94). A French journalist, born in Brussels. He was on the staff of the *Gaulois* (1859), the *Grand Journal*, the *Causerie*, and other journals before joining that of *Figaro* (1863), and his series of critical articles on current literature called *Paris au jour le jour* were published in both the *Evénement* and *Figaro*. He was editor-in-chief of the latter periodical from 1876, and raised it to a high state of excellence from which it declined after his death. He wrote an anti-clerical romance, *L'abbé Jérôme* (1869), and *Vie et aventures d'un positiviste* (1876).

MAGNE, mȧ'ny', Pierre (1806-79). A French statesman, born at Périgueux, Dordogne. He studied law at Toulouse, and became, in 1835, counselor to the prefecture of Dordogne. In 1843 he was elected to the Chamber of Deputies, and quickly gained a reputation as a financier. He was Under-Secretary in the War Department in 1847, and in the Department of Finance in 1849. He became Minister of Public Works in 1851, Senator in 1852, Minister of Commerce and Agriculture in 1853, and Minister of Finance in 1855, keeping office till 1863, the last three years without portfolio. In 1867 he came into power again as Minister of Finance. He went out in 1869, as Ollivier (q.v.) came in, returned to office with Broglie in 1873, and held the Treasury for a year. In 1876 he was elected Senator for Dordogne.

MAGNENTIUS, măg-nĕn'shĭ-ŭs, Flavius Popilius. A Roman Emperor of the West (A.D. 350-353). He was of barbarian extraction, but soon rose to the rank of count under the Emperor Constantine the Great. Entering the service of Constans, son of Constantine the Great, Emperor of the West, he was put in command of the troops that defended the Rhine, and plotted the overthrow of that prince. With the aid of Marcellinus, count of the sacred largesses, his plot was successful. Marcellinus having invited the officers of the army, stationed near the city of Autun, to a banquet in honor of the birthday of his son, at a late hour introduced Magnentius arrayed in robes of royalty. The cry 'Long live Augustus' was raised by several conspirators, Constans was assassinated, and Magnentius took possession of the palace at Autun (January 18, 350). In a short time Gaul, Italy, and most of the western provinces, acknowledged the usurper as Emperor. Constantius, the brother of Constans, and Emperor of the East, hastened to avenge the death of his brother, and totally defeated Magnentius before the town of Mursa on the Drave, 351. Magnentius fled to Italy, thence to Gaul, where Constantius followed him, and again in 353 defeated him in the Cottian Alps. On the eve of being captured by his enemies, and deserted by the countries that had acknowledged him, he committed suicide at Lugdunum (Lyons), August 11, 353. Constantius thus became master of the whole Empire.

MAGNES, măg'nēz (Lat., from Gk. Μάγνης). An Athenian writer of comedies, who flourished in the earlier half of the fifth century B.C. He is the first comedian of whom we know that he won a dramatic prize; he introduced the dance of fantastic imitations of animals in the comic chorus; and, if we judge rightly from a passage in the *Knights* of Aristophanes (vv. 520 et seq.), lost his popularity in his later years by the omission of such attractive and spectacular features.

MAGNE'SIA (Lat., from Gk. Μαγνησία). In ancient geography, the eastern district of Thessaly. It is a narrow and rocky strip of coast land, south of the river Peneus, and bordered on the west by the range of Ossa and Pelion. The Magnetes seem to have emigrated in part to Asia Minor, when the Thessalians occupied the region. Those who remained, while acknowledging the Thessalian supremacy, were neither reduced to serfs (Penestæ) nor made members of the Thessalian confederacy, but were included among the allies.

MAGNESIA. The name of two ancient Greek cities of Asia Minor. The first was in the northern part of Lydia, near the Hermus, about 25 miles northeast of Smyrna, at the foot of Mount Sipylus, and was called *Magnesia near Sipylus* (*Magnesia ad Sipylum*), to distinguish it from the other. It seems to have been settled by Magnetes from Thessaly during the Æolian colonization, but, as was natural in a Greek city so far inland, early to have fallen under Lydian rule. It regained its prominence under the Seleucid kings of Syria, and was the scene in B.C. 190 of a great battle in which the Romans utterly defeated Antiochus the Great. It was nearly destroyed by an earthquake in the reign of Tiberius, but was rebuilt, and under the Byzantine Emperors flourished greatly. After its capture by the Seljuks and later by the Ottomans, it retained its importance, and under its modern name, Manissa, is a flourishing town with fine buildings, on the Smyrna-Alashehr railroad. In this region, near Mount Sipylus, Greek legend located the Kingdom of Tantalus and myth of Niobe. There are remains of very early settlements on the slopes of Mount Sipylus. The second Magnesia was in Caria, in the valley of the Mæander, and called *Magnesia on the Mæander* (*Magnesia ad Mæandrum*), to distinguish it from that near Mount Sipylus. It was 15 miles from Ephesus. This city seems also to have been a colony of Magnetes, whose wanderings through Delphi and Crete to Asia were part of the legendary history of the city. It early became wealthy and powerful, but was destroyed in the first half of the seventh century B.C. by the Cimmerian invaders. It was rebuilt and afterwards conquered by the Persians. King Artaxerxes assigned it to Themistocles as a residence, and after his death here, about B.C. 460, the inhabitants paid him honors as to a hero. In the neighborhood was a celebrated temple of Artemis Leucophryne, and when about B.C. 400 the old site of the city was for some reason abandoned, the inhabitants withdrew to the higher ground around the temple, where a new city was built, which, though never very prominent, was later the seat of a bishopric. The temple was Ionic, and of great beauty. Part of its sculptured frieze was brought to the Louvre by Texier, and the rest is in Constantinople. Excavations conducted for the Berlin Museum by Dr. Humann in 1891-93 laid bare the temple, and also brought to light the Agora, theatre, and other buildings, as well as many inscriptions, including one containing the legendary account of the founding of the city. Consult: Kern, *Die Gründungsgeschichte von Magnesia am Maiandros* (Berlin, 1894); id., *Die Inschriften von Magnesia am Mæander* (Berlin, 1900).

MAG′NESITE (from *magnesium*). A magnesium carbonate that crystallizes in the hexagonal system, has a vitreous lustre, and is either white, light yellow, or brown in color. It is usually found in the form of irregular veins in serpentine and other magnesium rocks, being a deposition product either of the serpentine itself or of the original rock from which the serpentine is derived. It is found in many localities in Moravia, Styria, Silesia, and Norway; and in the United States in Maryland, New Jersey, Massachusetts, New York, California, and Washington. This mineral finds considerable use in the preparation of magnesian compounds, such as Epsom salts, magnesia, and in the manufacture of paint, paper, and fire brick; also to some extent as an adulterant for the cheaper grades of soap. A variety containing iron is called *breunnerite*, or *brown spar.*

MAGNESIUM, măg-nē′zhĭ-ŭm *or* -shĭ-ŭm (Neo-Lat., from *magnesia*, from Gk. *μαγνησία* [sc. λίθος], *magnēsia* [sc. *lithos*], magnesian [sc. stone], magnet, from *Μαγνησία*, *Magnēsia*, a district in Thessaly, where magnetic stones abounded). A metallic element first isolated by Davy and Bussy. Certain isolated salts of magnesium were known in the seventeenth century, the sulphate, for instance ('Epsom salt'), having been found in the mineral waters at Epsom, England. The element is not found native, but its compounds are widely distributed as the minerals *magnesite* or magnesium carbonate, *dolomite* or magnesium-calcium carbonate, *kieserite* or magnesium sulphate, *kainite* or magnesium sulphate with potassium chloride, *carnallite* or magnesium-potassium chloride, as well as numerous other minerals, containing smaller quantities. Magnesium also forms the chief constituent of many silicates, such as *augite*, *hornblende*, *olivine*, *serpentine*, *tourmaline*, and *meerschaum.* It is further found in the bones of animals and in the seeds of the cereals. The metal itself was originally obtained by heating magnesium chloride with potassium in a platinum crucible, and washing out the resulting potassium chloride with water. It may be made by the action of metallic sodium on magnesium chloride, but it is more cheaply obtained electrolytically.

Magnesium (symbol, Mg; atomic weight, 24.36) is a silver-white, lustrous, hard metal that is malleable and ductile, has a specific gravity of 1.75, melts at about 500° C., and boils at about 1000° C. It finds use as an illuminant, burning readily when in the form of filings, wire, or ribbon, with a white light of great brilliancy; thus, a burning magnesium wire of 0.297 millimeters thickness produces a light equal to 74 stearin candles; hence its application for flashlights in photography, for signals, and in fireworks. Magnesium combines with various other metals to form alloys, the most interesting of which are those with potassium and sodium, which decompose water at ordinary temperatures. A silver-white alloy of aluminum and magnesium, called *magnalium*, has been recommended for lens mountings, spectacles, etc. When ignited in the air or oxygen it forms an *oxide*, MgO, which is a white, light, infusible, amorphous powder that is extensively used in the manufacture of crucibles, cupels, fire bricks, etc. It is also used, like lime, for the production of a light similar to the calcium light. (See Drummond Light.) The commercial article is obtained by prolonged ignition of the carbonate or the hydrate, both of which are derived from the saline deposits of Stassfurt, Germany. The oxide, as well as the carbonate, of magnesium finds use in medicine as a laxative and antacid. When mixed with water, the oxide gradually changes into the *hydrate*, which is also found native as the mineral *brucite.* The hydrate is used for extracting sugar from molasses, forming an insoluble, granular, crystalline magnesium saccharate, which, when decomposed by carbon dioxide, yields pure sugar. The *carbonate*, which is known commercially as *magnesia alba*, is prepared by precipitating either the sulphate or the chloride with sodium carbonate. The *sulphate*, or Epsom salt, which occurs as the purgative principle of various spring waters, is obtained commercially from the minerals kieserite and epsomite, or by decomposing dolomite with sulphuric acid. This salt is largely used as a fertilizer, as a refrigerant cathartic in medicine, for dyeing with aniline colors, and for warp-sizing cotton. The *chloride*, which occurs native with potassium chloride as carnallite in the Stassfurt deposits, is used by cotton spinners as a thread lubricator, and as a source for other magnesium salts. The *citrate*, which is official in the United States Pharmacopœia, is used in medicine as a laxative.

MAGNESIUM LIMESTONE. See Dolomite.

MAGNET. A substance which has the power of attracting iron, nickel, cobalt, and certain other substances. A magnet may be either natural, as in the case of lodestone, or artificial, as in the case of magnets produced from iron or steel. See Magnetism.

MAGNETIC CURE (from Lat. *magnes*, from Gk. *μάγνης*, magnet, from *Μαγνησία*, *Magnēsia*, a district in Thessaly, where magnetic stones abounded). It was held by physicians of old that the magnet exercised an important influence on the human body, or on the bodies of certain persons; this being shown in the alleviation of headache, toothache, cramps, etc. It has, however, been proved that the magnet as such has no influence on animal organisms, and that accordingly all cures professedly resting on such action have been due to delusion or deceit. But it is quite otherwise with magneto-electricity and galvanism. See Electricity, Medical, Uses of. Consult Peterson and Kenelly, "Magnetism," in *New York Medical Journal* (August 8, 1892).

MAGNETIC ELEMENTS. See Magnetism, Terrestrial.

MAGNETIC EQUATOR. An imaginary line surrounding the earth near the geographical equator on which the longitudinal axis of a freely suspended homogeneous magnet, symmetrically magnetized, lies in a horizontal plane without *dip* (q.v.). It is a rather irregular curved line crossing the equator in several places, but never receding from it more than about 12 degrees. It is shown on the map of equal magnetic inclination in the article Magnetism, Terrestrial. See Compass; also Magnetism, Terrestrial; and Deviation.

MAGNETIC MERIDIAN. See Magnetism, Terrestrial; Compass.

MAGNETIC MOUNTAIN. In the *Arabian Nights*, a mountain which attracted passing ships and by its magnetic power drew out the nails and fastenings, and so destroyed the vessels. The tale appears in various works of literature.

MAGNETIC NEEDLE. See Compass; Deviation; Magnetism, Terrestrial; Magnetism.

MAGNETIC NORTH. See Magnetism, Terrestrial; Compass.

MAGNETIC POLE, UNIT, Definition of. See Magnetism; and Electricity, section *Laws of Steady Electric Currents.*

MAGNETISM. The name 'magnet' is given any body which possesses the power of attracting pieces of iron. There are certain natural ores which have this power, but all magnets actually in use are artificial. The origin of the use of a magnetic compass as a means of obtaining approximately the direction of the geographical North Pole of the earth is unknown, but the first scientific work on the laws of magnets was done by William Gilbert (1540-1603), who published his researches and ideas in his great book *De Magnete.* Since his time the most important work has been done in connection with electric currents. (See Electricity.) Several attempts have been made to explain magnetism, that is, to explain the magnetic action of a molecule of a magnetic substance by some electrical theory. Ampère advanced the idea that in each such molecule there is an electric current flowing in a fixed path. This idea is not, however, in accord with modern conceptions of the nature of a molecule. Weber tried to account for diamagnetism by the idea of induced electric currents in the molecules. A more modern theory is one proposed tentatively by J. J. Thomson, in which molecular magnetism is regarded as due to rotation of the molecule with its Faraday tubes connecting the atoms.

In addition to attracting iron, magnets attract pieces of other kinds of matter, e.g. nickel, cobalt, manganese, chromium, and a few others, while they repel small pieces of bismuth, antimony, silver, and a few other substances. It was shown by Faraday that the question of repulsion or attraction depended entirely on the relative magnetic properties of the substance which is being acted on by the magnet and the material medium in which it is immersed—this last is, of course, generally air. Those bodies which when surrounded by air are attracted toward a magnet are called 'magnetic' or 'paramagnetic' substances; while those which under similar circumstances are repelled are called 'diamagnetic.' (See Diamagnetism.) Faraday showed, too, that there is in neither case attraction or repulsion if the magnetic field is 'uniform;' that is, if there is the same magnetic force felt at each point of the surrounding air.

There are two methods in general use for making artificial magnets: one is to take a bar or a needle of a magnetic substance, e.g. iron or steel, wrap an insulated wire around it like thread on a spool, and pass a strong electric current through the wire; the other is to take as before a bar or a needle of a magnetic substance and place it near a magnet. (A modification of the latter method will be described later.) The intensity of the magnetization is increased in both cases by hammering the bar while the magnetizing action is going on. It is found that a piece of steel magnetized in this way remains so for a long time; while a piece of iron loses its magnetization.

If a number of such bar magnets or magnetic needles are made, the following facts may be observed: If a magnet in the form of a bar or needle is suspended so as to be free to rotate around a vertical pivot, as in the mariners' compass (q.v.), it will turn and place itself in a generally north and south direction. The end of the magnet which points toward the north is called the 'north pole' of the magnet; and the other, the 'south pole.' This proves that the earth itself has magnetic actions; and the plane which includes the centre of the earth and the direction of the magnetic needle at any point on the earth's surface is called the 'magnetic meridian' at that point. It should not be thought that the 'poles' of a bar magnet are definite points. Magnetic forces may be felt over the whole magnet, but of course more intensely near the ends. In any definite case the resultant of all these forces on any one outside body will pass through a certain point in the magnet; but this point will change with the position of the outside body.

If this magnet is floated on water, it is found that there is no translation, simply a rotation around a vertical axis. The magnetic field due to the earth must be uniform for any limited region on the earth; and this experiment proves that in a uniform field the forces acting on the two ends of a bar magnet are equal and opposite. This is sometimes expressed by saying that the north and south poles of a bar magnet have equal 'strengths.'

If a bar magnet is broken in two, both parts are magnets with poles at the ends. This leads to the idea that magnetism is a property of the molecules of the magnetic body. In fact, when a bar of iron is magnetized, its volume changes, its elasticity changes, etc.; if it is magnetized and demagnetized rapidly by using an alternating current in the magnetizing helix, its temperature rises. (If the temperature of a magnet is raised to red heat, it loses its magnetization.) Further, if a magnet is jarred or twisted, or if its temperature is raised, its magnetization is altered. In short, any physical action which affects the molecules of a magnet alters its magnetization; and any change in the magnetization alters the molecular properties. This establishes the fact that magnetism itself is a molecular property; and that if a molecule of a magnet could be obtained, it would have a north and a south pole like those of a bar magnet. It is impossible, therefore, to obtain a north pole apart from its equivalent south pole. There are no such forms of matter as magnetic conductors which enable the poles to be separated. This fact is illustrated by the phenomenon of induction described below.

If two bar magnets are brought near each other, it may be shown that like poles repel each other, and unlike poles attract each other; and further the action of a north pole of any one magnet on the north pole of another is equal and opposite to that of the south pole if the former is placed at the same distance from the north pole of the second magnet.

If a bar magnet is placed in air, and if a piece of any matter different from air is brought near it, this piece is observed to manifest magnetic forces at different points; it is said to be magnetized by 'induction,' and the forces of attraction or repulsion ordinarily observed with magnets acting on iron, etc., are due to the presence of these 'induced charges' of magnetism. If the piece of matter is of iron or any magnetic material, it is magnetized in such a manner that, if it is nearest the north pole of the magnet, its face which is next this pole is a south pole. (If the piece of matter is bismuth, the opposite is true.) It is perfectly easy to explain the induction of iron or other magnetic substances if it is assumed that each molecule of the magnetic substance is a magnet. Then, before this body is put near the magnet, the molecular magnets are standing at random, and there is no external action; but, when it is brought near the magnet, each molecular magnet is acted upon by a couple which tends to make it turn and point toward the magnet, its south end being attracted toward the magnet's north pole. By this action all the little magnets are more or less arranged in order; and at the end near the north pole of the magnet there will be almost nothing but south poles of the molecules, etc. All the facts of magnetization of iron, e.g. saturation, hysteresis (q.v.), etc., can be explained by this idea of the molecules of iron, nickel, etc., being themselves magnets.

If a bar of iron is placed lengthwise between two magnets connecting two opposite poles, and if two bar magnets with their opposite poles together are held nearly vertically at the middle point of the iron bar and then drawn slowly apart along the iron bar, it becomes magnetized, especially if the process is repeated several times. This is known as the method of 'divided touch.' Its explanation is evident from the theory of molecular magnets.

It is observed that if a small magnet is pivoted, free to turn, inside a helix of wire, it will place itself parallel to the axis of the helix when an electric current is passed through the latter. It is evident, then, why a bar of iron placed through the helix becomes magnetized by the action of an electric current.

The law of action of magnets on each other may be given if the words 'equal poles' and a unit magnetic charge or 'unit pole' are defined. Two magnetic poles are defined as being equal if they have the same action on any third pole; and a 'unit pole' is chosen to be such that when acting on another unit pole at a distance of 1 cm. in a vacuum the force is 1 dyne. To find the numerical value to give any pole it is necessary to find what combination of unit poles has the same action on a third pole. Experiments then show that the action of a pole whose magnetic charge is m upon one whose charge is m' at a distance r cm. apart varies directly as the product mm' and inversely as r^2, and is different for different surrounding media. This law may be expressed $f=\frac{mm^1}{\mu r^2}$, where μ is a quantity which differs for different material media. It is called the 'magnetic permeability' or the magnetic 'inductivity.' (Compare the quantity K in *Electrostatics* under ELECTRICITY.)

The dimensions of a magnetic charge may be at once found. The square of a charge has the dimensions of $\mu r^2 f$, i.e. μL^2MLT^{-2}. Hence the charge itself has the dimensions $L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-1}\mu^{\frac{1}{2}}$.

This law of magnetic action has been verified approximately by Coulomb, it being called his law, so far as the statement that the force varies as $\frac{mm^1}{r^2}$ is concerned, and later by Gauss, who used an indirect method, and by the countless experiments and calculations made daily by electrical engineers. The importance of recognizing the effect of the surrounding medium was first emphasized by Faraday.

The region around a magnet is called its 'field of force;' the 'intensity' of the field at any point is the force which would act on a unit north pole if placed there; the 'direction' of the field is the direction of the intensity; a 'line of magnetic force' is a line drawn in a magnetic field so as to indicate by its direction at any point that of the field at that point; a 'uniform field' is one in which the lines of force are all parallel, and the intensity is the same at all points. Such a field is a limited region on the earth due to magnetic action of the earth, or the space between the poles of a horseshoe magnet or between the field-magnets of a dynamo. The intensity of any uniform field may be measured by several means; the best for many reasons is that of Gauss. If a magnet of any kind or shape is suspended in a uniform magnetic field, free to turn around an axis perpendicular to the direction of the field, it will turn and take some definite position; in order to keep this magnet in a position at 90° from this against the action of the field of force will require the application by some external agency of a certain couple or moment; the amount of this couple, if the intensity of the uniform field is unity, is called the 'magnetic moment' of the magnet about the given axis. If the magnet is uniformly magnetized—i.e. if in case it is broken into two, three, etc., equal parts, they will all be alike in every way—the magnetic moment divided by the volume of the magnet is called its 'intensity of magnetization.' If the magnet is a bar or rod or wire, uniformly magnetized, so that there is no magnetization except at the ends, it is called a 'solenoid,' and the distribution of magnetic charges is called 'solenoidal' (thus the magnetic action of a long helix of wire carrying an electric current is approximately solenoidal). If the magnet consists of a thin sheet with all the molecular magnets side by side, having their north poles on one face of the sheet and their south poles on the other, it is called a 'lamellar' distribution. (Thus the magnetic action of a single loop of wire carrying an electric current has this lamellar property.)

Lines of magnetic force may be drawn by placing a small magnetic needle at different points in the field of force and noting its direction. Still another method is to sprinkle iron filings through the field, e.g. over a glass plate or smooth piece of paper; each filing becomes magnetized by induction, and if the filings are jarred slightly each will turn and place itself along the line of force at the point where it is. (Actually there will be a force of attraction toward the magnet; but it is resisted by the friction between the filing and its supporting plate or paper.) It may be observed immediately that lines of force join opposite poles of magnets in the air; and, since the molecules of a magnetic substance are also magnets, the lines of force can be imagined as proceeding from molecule to molecule inside the magnet. In this sense, lines of magnetic force are continuous closed curves—not like lines of electric force which end on charged surfaces. Tubes can be imagined constructed, by choosing somewhere in a magnetic field a small closed curve, and drawing through each point of it the line of force. Such tubes are continuous and closed like an ordinary piece of rubber tubing with its two ends brought together. If the cross-section of these tubes is so chosen that the number passing out at the north pole of a magnet on which there is a magnetic charge m is $4\pi m$, they are called 'tubes of induction.' It is shown in electricity that if the number of such tubes passing through a closed circuit of wire is changed, there will be an induced current in the metallic circuit; the total quantity of electricity carried by this current varies directly as the change in the number of tubes of induction. This gives the simplest and most accurate method of determining the distribution of magnetic charge over the surface of a magnet. If the magnet is in the form of a rod, a coil of wire having its two ends joined to a galvanometer may be slipped over it. The tubes of induction enter the magnet wherever there is any south magnetic charge, i.e. where the south poles of the molecular magnets reach the surface, and leave it where there is any north magnetic charge, i.e. where the north poles of the molecular magnets reach the surface. Tubes are crowded together about the middle of the rod and then escape at the sides and south ends, returning into the sides and end at the other pole of the rod. As the small exploring coil is pushed along the rod from the centre to the north end, the number of tubes inside decreases, owing to the passage out from the rod of the tubes of induction; the induced quantity of electricity measures the decrease in the tubes; that is, the number of tubes leaving the sides of the magnet, and therefore the magnetic charge over them, because one tube corresponds to a magnetic charge 4π.

The energy of a magnetic field is identical with that associated with an electric current. (See ELECTRICITY.) Whenever attraction or repulsion is observed to take place, the motions must be such as to decrease the potential energy and increase the kinetic, at least temporarily.

MAGNETIC PROPERTIES OF IRON. We have seen that when an electric current is sent through a coil or spiral of wire the coil is found to have the properties of a magnet; that is to say, it will attract bits of iron, deflect a magnetic needle, etc. The region around the spiral when the current is flowing in it is called a magnetic field. The intensity or strength of the field is defined as the force which would act on a unit north pole, and so varies from point to point in the neighborhood of the spiral. In describing this field the convention has been adopted of imagining the field traversed by lines of force which indicate by their direction the path the unit north pole would follow if free to move. When the field has unit strength it is said to contain one line of force per square centimeter perpendicular to the direction of the line. It may be shown that the intensity of the field, or the number of lines of force per square centimeter within the spiral carrying the current, is represented by the formula $H = 0.4\pi ni$, H being the intensity of the field, n the number of turns per unit length of the spiral, and i the current strength in amperes.

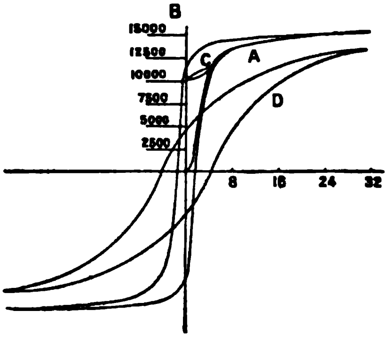


FIG. 1. CURVES OF MAGNETIZATION.

If now the coil is wound on a core of iron, nickel, or cobalt, its properties as a magnet are found to be greatly intensified; that is to say, the number of lines of force per square centimeter is increased; i.e. the core has become magnetized. The number of lines of force per square centimeter within the core is called the *induction*, and is usually designated by the letter B. The ratio of the induction B to the intensity of the field H is called the *permeability*, μ; i.e. $B = \mu H$. For air B is evidently equal to H.

since we have defined H as the number of lines of force per square centimeter when the coil has no core. Thus μ for air is equal to 1.

The permeability μ differs widely in different materials, and in any one material may vary widely with the induction B. For in any one of the metals above mentioned with a uniformly increasing H, B increases at first slowly, then rapidly, then slowly again, entering a region in which the increments of B are exactly equal to the increments of H. In this region the material is said to be saturated. This process is shown in the curve A in Fig. 1. It will thus be noticed that with increasing values of H the ratio of B to H varies widely. In Fig. 2, a curve is given which shows the variation of the permeability in a given specimen of iron for different values of H; as indicated, μ increases rapidly, at first corresponding to the rapid increase in B, then decreases, corresponding to the portion of the BH curve in which the material is approaching saturation. The values of the permeability and so of the induction which may be attained in iron are greatly in excess of those obtainable in other materials, and this together with the fact that it is so much more common in nature has led to its widespread adoption in the construction of electric machinery and all apparatus in which it is necessary to have strong magnetic fields.

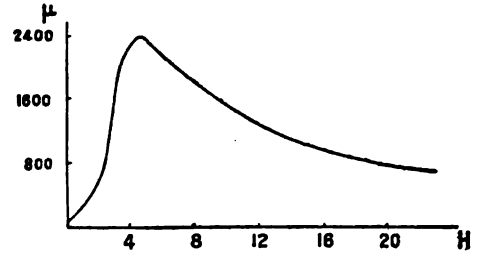


FIG. 2. CURVE SHOWING VARIATION IN PERMEABILITY.

The behavior of iron when subjected to a magnetizing force is usually represented by the curve between the induction B and the intensity of the force H mentioned above. Such a curve taken from a particular sample of soft iron is shown in curve A, Fig. 1. With iron in the neutral state, that is, starting from H=0, with increasing H, B increases slowly at first, then very rapidly, then more and more slowly, the curve approaching a slightly inclined straight line a little above 15,000. This is the region commonly spoken of as the saturated state; that is, although H may be continually increased, the corresponding increase in B does not exceed that of H. If now H be decreased the values of B will not traverse the same path that they did for increasing H, but the values of B will be higher for the same value of H than those on the ascending curve. When H is reduced to zero again, B has still a considerable value; that is, about 11,000. There is thus within the iron a considerable amount of residual magnetism. If now H is increased in a reverse direction, B may be brought to zero, and on still further increase of H, begins to increase in the other direction; i.e. the lines of force now pass through the iron in the opposite direction. The value of H which is required to reduce the residual magnetism, that is, to bring B to the zero value, is called the coercive force. When H is increased in the reverse direction, the induction B traces the same form of curve as during the original ascent of H; that is to say, it increases rapidly for low values of H and then gradually approaches the region of saturation. If H is now decreased again there is found to be a residual magnetism of about the same amount, but of opposite sign to that before found. If H is now increased in the same direction as at the starting of the process, the residual induction is reduced to zero only by a definite positive value of H. A further increase of H results in the rapid increase of B, and the curve finally merges into the original ascending curve. If now the same cycle of processes be gone through, the induction will traverse the same paths. The cycle then forms a closed curve of definite area. If at any point in the curve, such as the point C, H be decreased, B does not decrease over the path of increase, but tends to hold its value, or *lags* behind the change in H. On increasing H again the lower part of loop C is formed, and on further increase the path joins the original curve. This tendency of B to hold its value, or to lag behind H and so to form closed loops, is called *hysteresis*. When iron is carried through the hysteresis cycle there is a loss of energy due to molecular friction and work done against other molecular forces consequent upon the reversal of direction of magnetization. This energy loss is manifested in a heating of the iron. It may be shown that this loss in ergs per cycle is proportional to the area of the hysteresis curve.

The magnetic properties of iron vary widely for different specimens. These variations depend in the first place on the past history of the material; that is to say, whether it has been annealed, hardened, stretched, twisted, or subjected to any treatment which would be likely to affect the molecular structure. In the second place, they depend on the chemical composition; that is to say, the presence or absence of such substances as manganese, carbon, etc. In general it may be stated that the softer the iron the greater the values of B and μ which may be obtained. The curve A, Fig. 1, is taken from a test on an average specimen of good soft iron. The maximum value of B is about 15,000, the maximum μ about 245, corresponding to H=4.5. The whole curve in this case is unusually narrow, and therefore incloses a small area, showing that in soft iron B follows H with greater readiness than in harder specimens, and that the loss due to hysteresis is smaller. When subjected to a magnetizing force the behavior of soft iron is particularly sensitive to any kind of mechanical disturbance. Thus if the specimen be lightly tapped while any given value of H is applied, the corresponding value of B may be largely increased. It retains considerable residual magnetism if undisturbed, but this residual practically disappears if the iron is tapped or heated, or the molecular structure is disturbed in any way. If soft iron is mechanically hardened in any way, that is to say, if it is hammered, rolled, stretched, or twisted, its permeability and value of residual magnetism are much lessened, and the coercive force is increased.

If, while the iron is on the descending part of the hysteresis curve and so has the higher value of B for any given value of H, an electric oscillation is caused to pass through a coil surrounding the specimen, it is found that the value of B drops suddenly to the lower value, that is, the value on the ascending part of the curve. The electric oscillation sets up a molecular disturbance. This fact is made use of in the magnetic detector used in wireless telegraphy. The sudden decrease in induction is used to induce an electric impulse in an auxiliary circuit containing a telephone. The effect of hardening is shown in curve D, Fig. 1, which is taken from a test on the same sample of iron which gave the curve A after it had been subjected to a hardening process of rolling and stretching. It will be noticed that the maximum values of B are lessened, the permeability is less throughout, the residual magnetism is less, the coercive force greater, and the area of the closed curve appreciably larger.

When iron is subjected to such mechanical treatments as those mentioned above, and to annealing, hardening by quenching, tempering, etc., the various resulting grades of steel have widely different magnetic qualities aside from those due to differences in chemical composition. Speaking generally, a mild or soft steel is also magnetically soft; that is to say, μ is high and the coercive force low. The harder the steel the greater its magnetic hardness. This has been already illustrated in the two curves given above. If two samples of steel differ in the amounts of carbon contained in them, the one having the greater amount is both mechanically and magnetically the harder, the permeability is lower, the coercive force higher. For this reason permanent magnets are made of steel. Also a specimen hardened by tempering is found to be much harder than one of the same chemical composition which has been annealed.

Other substances than carbon affect the magnetic quality of iron, sometimes very greatly; chromium and tungsten increase the coercive force tremendously. For this reason tungsten is generally used in magnet steel. The coercive force in soft iron is about 2, while that in tungsten steel may exceed 50. Cast iron reaches a somewhat lower magnetization than wrought iron or steel, even for high values of H. When saturated B is about three-quarters of the best values in iron. For moderate values of H in permeability and coercive force it generally resembles mild steel.

In certain alloys of iron there is a marked absence of magnetic quality. The presence of manganese in large quantities is particularly detrimental. Thus in manganese steel, which contains about 12 per cent. of manganese and 1 per cent. of carbon, the permeability is only about 1.4, and is fairly constant in weak and strong fields; also, there is practically no residual magnetism. Nickel steel is also most remarkable. A specimen containing 25 per cent. of nickel was found to be practically non-magnetic under ordinary conditions of temperature, its permeability being practically constant at 1.4. Thus we have an alloy of two metals, each itself strongly magnetic, which has a practical absence of all magnetic quality. This alloy is also interesting in the further fact that when cooled to very low temperatures it becomes strongly magnetic and remains so after the temperature rises to ordinary values.

The effect of increase of temperature generally is to increase the magnetic properties of iron when the magnetizing force is low. This increase continues up to a temperature of 775° C., and beyond this temperature the iron suddenly becomes practically non-magnetic. This temperature is known as the critical temperature of magnetization, and the evidence is plentiful from other facts that there is a decided molecular change in the structure of the iron at this point. For instance, this is the region known as the point of recalescence in the cooling of iron from white heat. The suddenness of this loss of magnetic quality with temperature is less as the magnetizing force is greater, and for large values of H it may even happen that the permeability decreases with increase of temperature.

We have seen that the area of the loop of hysteresis represents a loss of energy. This fact is of no special importance if the magnetization is constant and in one direction; but if the magnetization varies, or if it reverses many times per second, as is frequently the case in electrical apparatus, this loss may be quite appreciable. Thus in the magnetic circuits of dynamo-electric machines the magnetization in the fields is always in one direction, and hence wrought iron of high permeability is used. In the armatures, however, and in alternating current apparatus in which the induction rapidly changes direction, the loss may be quite great and it directly affects the efficiency of the machine. (See DYNAMO-ELECTRIC MACHINERY.) Hence, in these latter cases, the iron is worked at lower induction and must be soft so as to give a narrow hysteresis curve. Steinmetz has expressed a convenient law for this loss. It is stated in the formula $W = \eta B^{1.6}$. W is the loss in ergs per cycle, B is the maximum induction, and η is a constant of the material; η varies from .00124 to .0055 and for good annealed iron has an average value of .0033. It may be as high as .015 for steel and .08 for tungsten and manganese steel. Thus at 60 cycles per second if the induction be 6000, for $\eta = .0033$ the loss in 100 cu. cms. would be 2.1×10^7 ergs per second or 2.1 watts. Closely allied with the hysteresis loss for alternating magnetization is the so-called Foucault or eddy current loss. When the induction alternates it induces currents in numerous little closed paths in the body of the iron due to its electrical conductivity. These currents, therefore, cause a loss of energy. To diminish these losses the iron is laminated so as to cut down the number of closed circuits in the body of the iron. In measuring iron losses due

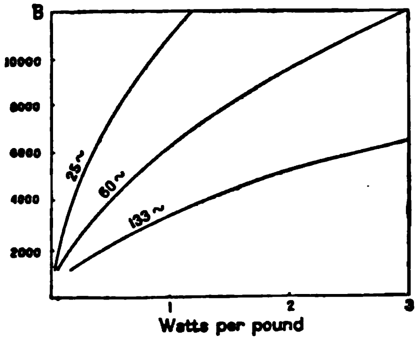
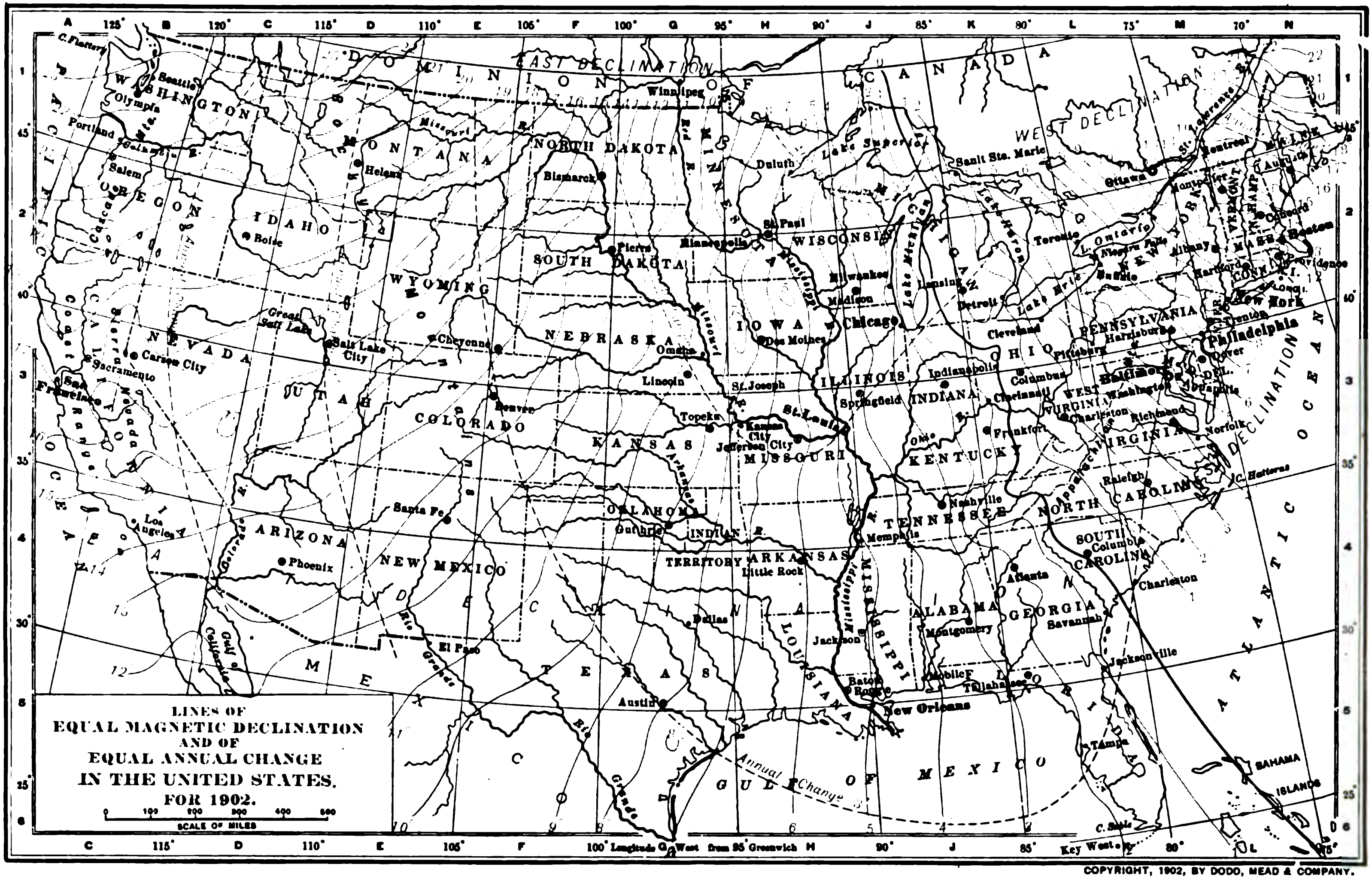


FIG. 3. CURVES SHOWING LOSSES OF ENERGY IN IRON.



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to alternating magnetization it is very difficult to separate these losses. In practice they are measured together and the curves shown in Fig. 3 give the loss per pound of good soft sheet steel .011 inch thick at different inductions for 25, 60, and 133 cycles per second.

BIBLIOGRAPHY. The books of reference mentioned in the article ELECTRICITY will also suffice for the subject of Magnetism, while in addition Ewing, *Magnetic Induction* (London, 1900), and DuBois, *The Magnetic Circuit in Theory and Practice*, translated by Atkinson (London, 1896), are to be recommended.

MAGNETISM, ANIMAL. See HYPNOTISM.

MAGNETISM, TERRESTRIAL. The fact that the earth has magnetic properties over its surface is shown by the behavior of a freely suspended magnetic needle, which at any one place on the earth's surface takes a definite direction, and so indicates the direction of the magnetic line of force at that point due to the earth's action. Owing to the great size of the earth, its magnetic field in any limited space—e.g. a few cubic meters—is uniform. The intensity of this field at any point and its direction are called the 'magnetic elements' of that point. To locate the direction the simplest method is to consider a plane drawn through the centre of the earth and the freely suspended magnetic needle—this is the 'magnetic meridian'—and another plane drawn horizontally through the middle of the needle. The angle made by the magnetic meridian and the geographic meridian is called the 'declination'; that made by the direction of the needle and the horizontal plane, the 'inclination' or 'dip.' All three of these quantities, the intensity, the declination, and the inclination, can be determined at any one point on the earth's surface. As they are all varying slightly continuously, in most magnetic observatories automatic self-registering devices are used to secure records of these fluctuations. See MAGNETOMETER.

There are daily vibrations of the elements, annual ones, and others also. That is, the daily variation is a gradual change in one direction and then a slow return. There are so-called 'magnetic storms,' when sudden and most violent changes in the elements take place. The occurrence of these storms obeys the same law as that of sun-spots on the sun; and the explanation of neither is as yet known. In addition to the periodic changes for each day and each year, there is a 'secular' change of all the elements which has not yet been shown to be periodic. If one were to look down a freely suspended magnetic needle from its centre, it would seem to point to some point on the surface of the earth. The position of this point is slowly moving from year to year; and since the year 1540 it has moved in approximately an ellipse over about two-thirds of the circumference in the direction of the hands of a watch. If nothing happens to disturb the orderly march of events, the magnetic elements at London in about the year 2010 will be the same as they were in 1540.

The simplest and most instructive manner of considering the magnetic properties of the earth is to imagine drawn on its surface:

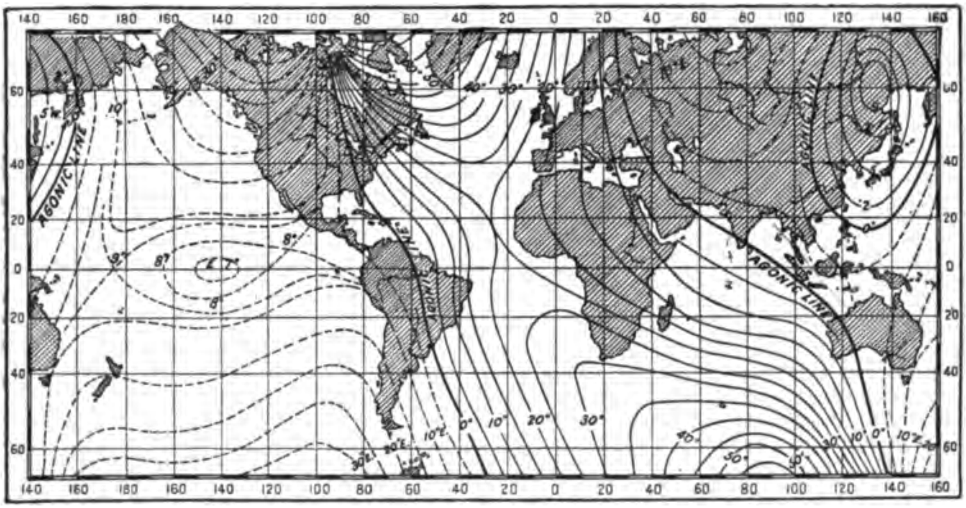


Chart showing lines of equal magnetic declination for 1905 (British Admiralty). Full lines indicate west declination and broken lines east declination.

(1) A series of lines such that at any point of one line the declination is the same. These are called 'isogonals' or isogonic lines (q.v.).

(2) A series of lines such that at any point of one line the inclination is the same. These are called 'isoclinals' (q.v.). The 'magnetic poles' are defined to be those points where the dip is 90°.

(3) A series of lines such that at any point of one line the intensity of the field is the same. These are called 'isodynamic lines' (q.v.).

There are other lines which may be drawn, but these three sets are the most important. They are changing from year to year owing to the 'secular variation.' The origin of the magnetic action of the earth is not known; but it undoubtedly has some connection with the fact that the earth is a huge portion of matter rotating rapidly on its axis. It can be shown that only a portion—about one-fortieth—of the magnetization of the earth can be due to causes external to itself; undoubtedly, however, some of the fluctuations of the magnetic elements are due to currents of electrically charged particles in the atmosphere. See ATMOSPHERIC ELECTRICITY.

Historical Sketch. The discovery of the change in the declination from point to point on the earth's surface is generally attributed to Columbus, 1492. Robert Norman, an instrument maker in London, first noticed the dip of a magnetic needle in 1576. The first real investigation of magnetic phenomena, and in particular the first theory of terrestrial magnetism, is due to Gilbert, 1600. The first magnetic charts ever published were those of Halley—lines of equal declination—in 1701, the result of two long voyages. The diurnal variation was discovered in 1722 by Graham, an instrument maker in London. The idea of taking systematic observations of the magnetic elements at different points on the earth is due to Humboldt. The first to make accurate observations of all the elements was, however, Gauss. The most important modern work is that of Schmidt, Schuster, Rücker, Mascart, and Bauer. Consult: Mascart, *Magnétisme terrestre* (Paris, 1900); *Terrestrial Magnetism*, a journal published by Dr. L. A. Bauer, Baltimore, Md.; and the various reports and other publications of the Division of Terrestrial Magnetism of the United States Coast and Geodetic Survey, especially *The United States Magnetic Declination Tables and Isogonic Charts and Principal Facts Relating to the Earth's Magnetism* (Washington, 1902).

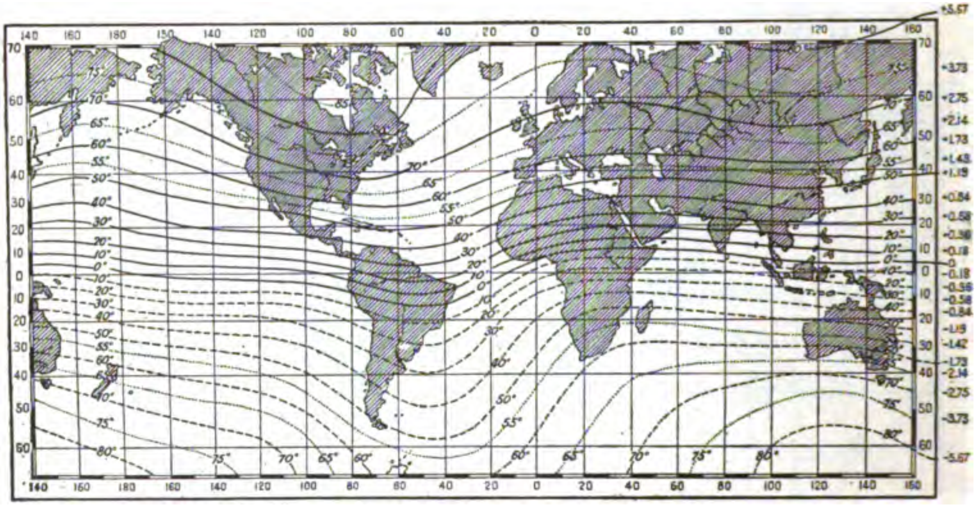
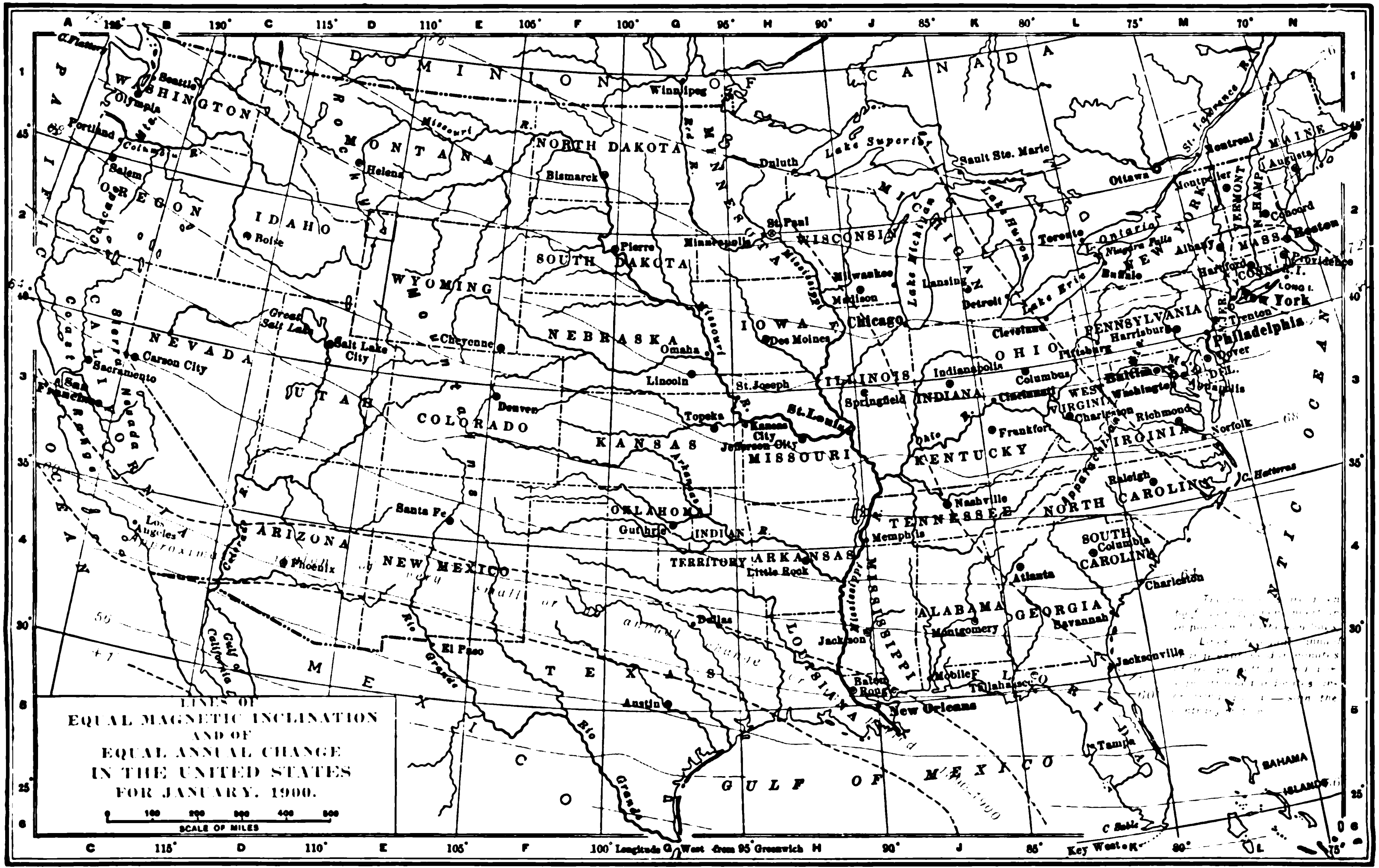


Chart showing lines of equal magnetic inclination for 1905 (British Admiralty). Full lines indicate increasing inclination and broken lines decreasing.

MAGNETITE, or Magnetic Iron Ore. An oxide of iron (Fe_3O_4) containing 72.4 per cent. metallic iron. It has an iron-black color, semi-metallic lustre, hardness of from 5.5 to 6.5 on the mineral scale, and a specific gravity of from 4 to 5. The crystalline form is isometric, commonly octahedra and dodecahedra, but it also occurs massive and in granular aggregates. Magnetite is readily distinguished from other ores by its strong magnetic properties; and in some cases it also exhibits polarity, being then known as lodestone. It is one of the most important commercial sources of iron, and is extensively mined in many parts of the world. In the United States it occurs in large deposits along the Appalachians, especially in the Adirondacks, in the Highlands of New York and New Jersey, at South Mountain, Pa., and in Virginia and North Carolina. It is usually associated with Archæan gneisses and crystalline limestones. Deposits of magnetite are also known in Minnesota, Missouri, Colorado, Utah, California, and in foreign countries. The important iron industry of Norway and Sweden is largely based upon magnetite ores. As a rock-forming mineral it is almost universally distributed throughout the igneous, sedimentary, and metamorphic rocks. The production of magnetite in the United States in 1901 was 1,813,076 tons. See Iron.

MAGNETO-ELECTRIC MACHINE. A machine for generating electricity by rotating a coil of wire in the field of a permanent magnet usually of the horse-shoe type. The principle of the instrument will be found described under Dynamo-Electric Machinery, and it is sufficient here to mention a few of its most important uses. A magneto machine is usually employed in blasting to detonate the charge. By means of a rack and pinion attached to the armature the latter is rapidly rotated and a current generated which heats a platinum wire and explodes a fulminate cap. (See Blasting.) Even more familiar is the magneto call bell used in connection with the telephone (q.v.). By turning the crank a large toothed wheel gearing into a smaller toothed wheel on the armature shaft is revolved, and a current generated which causes the bell at the distant station to ring. Magneto-electric machines are also employed for generating small currents for medical use. See Dynamo-Electric Machinery.

MAG'NETOM'ETER (from Gk. *μάγνης*, *magnēs*, magnet + *μέτρον*, *metron*, measure). Any compass needle so mounted that its angular deflections may be measured is a magnetometer. It may be a simple small magnetic needle supported upon a point and swinging over a divided circle, or it may be a large magnet hanging upon a fibre of silk or quartz or other material, and the deflections read with a mirror on the magnet and using a telescope and scale or a reflected beam of light. In a simple magnetometer the magnet hangs in a small house or box of wood or copper



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and the attached mirror is visible through the little window. The magnet and mirror are suspended upon the long silk or quartz fibre in the tube at the top of the instrument. Fig. 1 shows a more complicated form of magnetometer with an attached bar for supporting the magnet whose strength is to be measured, and which is placed at a definite distance from the magnetometer, and with its axis pointing toward the magnetometer, or at right angles to that direction.

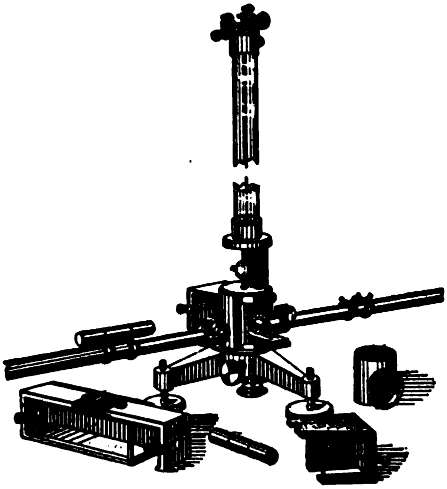


FIG. 1. GAUSS-WEBER MAGNETOMETER.

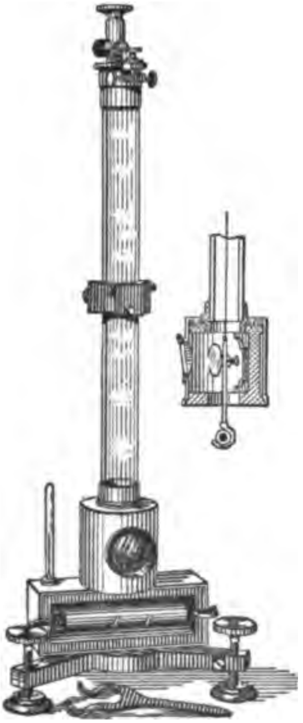


FIG. 2. KOHLRAUSCH TYPE OF PORTABLE BIFILAR MAGNETOMETER.

A magnetometer set up with its magnet in the magnetic meridian will show the declination (q.v.) and its variations; that is to say, it will show the deviation between the magnetic north as shown by the needle, and the true north as determined by astronomical observations. When the magnet is larger and supported, for example, on two fibres, as in Fig. 2, then the instrument is so set up that the bifilar suspension holds the magnet at right angles to the magnetic meridian. In this position the magnetometer measures the strength of the horizontal force of the earth's magnetic field, because if this latter increases then the bifilar system is twisted a little more, and if the earth's field decreases then the bifilar untwists a little.

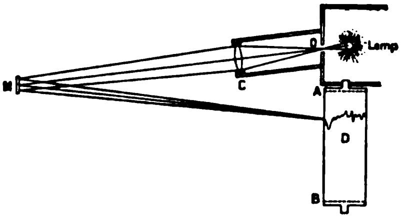


FIG. 3. RECORDING MAGNETOMETER.

The light from the lamp L, shining through the small opening O upon the lens C, is brought to an image of O upon the sensitive paper on the drum D, after being reflected from the magnetometer mirror M. Any angular motion of M around a vertical axis causes the image to move with reference to A and B. This motion, combined with that of the drum D as it is revolved by clockwork, gives a broken line as the record of the magnetic fluctuations.

A magnet so mounted that it can swing in a vertical plane will similarly give the inclination of the earth's field, or the 'dip' and its variations. Spots of light reflected from mirrors on the needles of these three last forms and allowed to fall upon a moving strip of photographic paper will give an autographic record of the variations of these three components of the field of the earth's magnetism, namely the declination, inclination, and horizontal intensity. The action of such an instrument is shown by the accom-

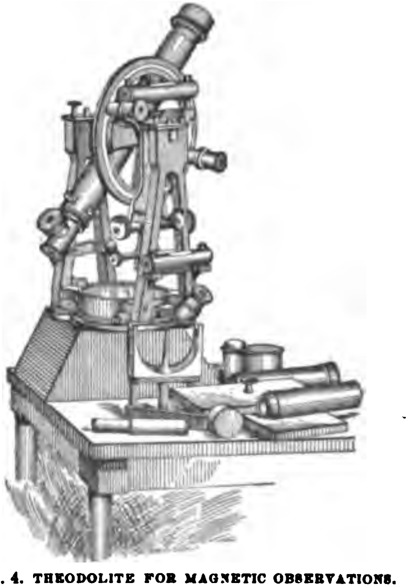


FIG. 4. THEODOLITE FOR MAGNETIC OBSERVATIONS.

panying sketch. These instruments are used at the various permanent stations of the Division of Terrestrial Magnetism of the United States Coast and Geodetic Survey. Figs. 4 and 5 show a theodolite used for the determination of the astronomical meridian, or true north, at a certain given station, and a standard form of magnetometer. In this the astronomical meridian is determined with the theodolite, which is then replaced on the mounting by the magnetometer. The reader can find full descriptions of magnetometers in the Bulletins of the Division of Terrestrial Magnetism of the United States Coast and Geodetic Survey and in the issues of *Terrestrial Magnetism* (Baltimore, current). The older forms of magnetic instruments will be found described in the larger treatises on physics, while the simple apparatus is discussed briefly in Thompson, *Elementary Lessons in Electricity and Magnetism* (enlarged ed., New York, 1901).

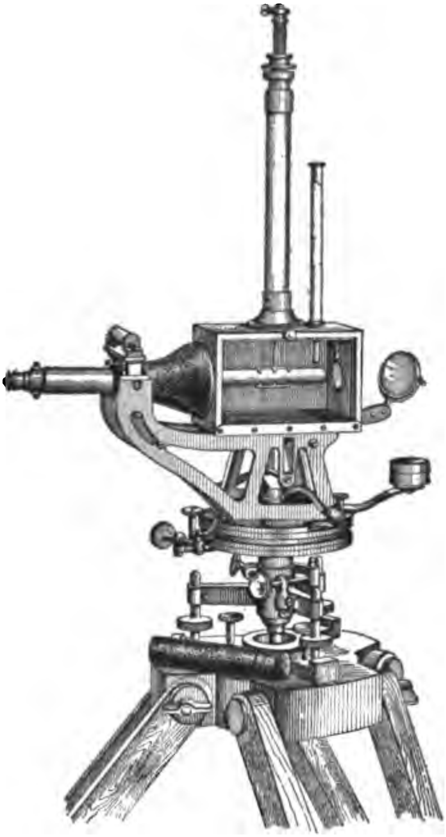


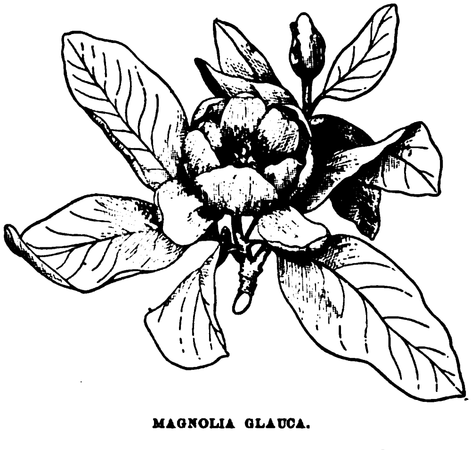
FIG. 5. UNITED STATES COAST AND GEODETIC SURVEY PORTABLE MAGNETOMETER.

MAGNIF'ICAT (Lat. *Magnificat anima mea Dominum*, My soul doth magnify the Lord). The song of thanksgiving originally uttered by the Blessed Virgin Mary (see Luke i. 46-55), and later incorporated into the service of vespers, in which it forms the principal part, corresponding to the other 'evangelical canticle,' the *Benedictus*, at lauds. At solemn vespers, during the singing of the *Magnificat*, the altar is censed by the officiant, vested in a cope. The English version was incorporated in the Anglican prayer-book, to be sung or said after the first lesson at evening prayer. It was omitted in the American prayer-book, but restored at the recent revision.

MAGNITUDE (Lat. *magnitudo*, from *magnus*, great), PERCEPTION OF. Size or magnitude, psychologically regarded, is a quantitative determination of extension. For its perception, see EXTENSION, and the perceptions of FORM, DISTANCE OR DEPTH, LOCALITY, and MOVEMENT.

MAGNO'LIA. A town and the county-seat of Columbia County, Ark., 140 miles southwest of Little Rock, on a spur of the Saint Louis Southwestern Railroad, and the terminus of the Louisiana and Northwest Railroad (Map: Arkansas, B 4). It is the centre of a fertile region, having valuable timber lands, and carries on a trade in cotton, fruit, and lumber, its commercial interests being of considerable importance. Population, in 1890, 1486; in 1900, 1614.

MAGNOLIA (Neo-Lat., named in honor of Pierre Magnol, a French botanist of the early seventeenth century). A genus of large-leaved beautiful trees of the natural order Magnoliaceæ, with large solitary flowers, having a calyx of three sepals, a corolla of six to twelve petals, and carpels arranged in cones. The species are natives chiefly of North America, the Himalaya Mountains, China, and Japan. The wood is in general soft, spongy, and of little value. *Magnolia grandiflora*, sometimes called the big laurel, is a lofty and magnificent evergreen, rendered conspicuous at a great distance by its white flowers sometimes a foot in diameter. It is found in the lower districts from North Carolina to the Gulf of Mexico. *Magnolia Umbrella* is found on the Alleghany Mountains, and extends as far north as latitude 43°. From the radiated manner in which its leaves are disposed at the extremities of the branches, it is called umbrella tree. It has very large white flowers. *Magnolia acuminata*, cucumber tree, inhabits the same districts, and is a lofty tree with greenish-yellow flowers, which are less admired than those of other species. *Magnolia glauca*, white bay, beaverwood, swamp sassafras, a native of Pennsylvania, Virginia, and Carolina, is a tree or shrub of 15 to 20 feet in height, with beautiful fragrant white flowers. The yulan, or Chinese magnolia (*Magnolia Yulan*), has been much cultivated in China for more than twelve hundred years, for its profuse, beautiful, fragrant white



MAGNOLIA GLAUCA.

MAGNOLIA AND MANGROVE

1. MAGNOLIA (Magnolia Soulangiana). 2. MANGROVE (Rhizophora Mangle).

flowers, which appear before the deciduous leaves. It is one of the finest of ornamental trees, and succeeds in most of the United States from New York southward. It is followed by *Magnolia Soulangiana*, a horticultural variety, and *Magnolia obovata*, a Japanese species, with purplish tinted flowers. *Magnolia macrophylla* and *Magnolia Fraseri*, American species, have about the same range as *Magnolia grandiflora*, are trees 40 to 50 feet in height and are conspicuous for the size of their leaves, which in *Magnolia macrophylla* become from two to three feet long and a foot across. Their flowers are rose red, the petals three to six inches long. The genus Magnolia appears first in the Cretaceous rocks of Europe, and its fruits and leaves are abundant in the succeeding Tertiary deposits of North America, Europe, Asia, and Australia, and also from the Arctic regions far outside the limits of its present distribution.

MAG'NUS. The name of several kings of Norway, Denmark, or Sweden. Magnus I., the Good, King of Norway (1035-47), and of Denmark (1042-47), was a son of Saint Olaf (q.v.).—Magnus II., the Barefooted, King of Norway about 1093-1103, conquered the Orkneys and Hebrides, and was killed in an expedition to Ireland.—Magnus Eriksson became King of Norway and Sweden in 1319. He gave Norway to his son Haakon about 1343. He reigned in Sweden until 1363, when he was deposed by his subjects, who gave the crown to Albert of Mecklenburg. Magnus died in 1374.

MAGNUS, mäg'nụs, Eduard (1799-1872). A German painter, born in Berlin, where he studied the natural sciences and philosophy at the university, besides architecture and painting at the academy. Subsequent travels in Italy, France, England, and Spain contributed essentially to his artistic development, and after his return to Berlin, where he became a member of the Academy in 1837 and professor in 1844, he occupied for a long time an influential position in the artistic world. Of his few genre pictures, "The Return of the Klepht" (1836, National Gallery, Berlin) is the most noteworthy, but his fame rests on the subtle refinement and sterling technique of his numerous portraits, among which only those of "Jenny Lind," "Thorwaldsen" (both in the National Gallery, Berlin), "Field Marshal Wrangel," "Henriette Sontag," and "Adolf Menzel," may be mentioned as conspicuous examples. To his mastery in portraying women an entire gallery of likenesses bears witness.

MAGNUS, Heinrich Gustav (1802-70). A German physicist and chemist, born at Berlin. He studied at Berlin and under Berzelius at Stockholm. At the age of twenty-six he had already made important contributions to chemistry, and in 1834 was made extraordinary and in 1845 full professor of physics and technology in the University of Berlin. His original investigations include important experiments on the transmission of heat through gases, a series of determinations of the vapor tension of water at different temperatures, and of the vapor tensions of homogeneous liquid mixtures, etc. Consult Hofmann, *Zur Erinnerung an Gustav Magnus* (Berlin, 1871).

MAGNUS, Olaus (c.1490-1558). A Swedish historian, born at Linköping. Following the lead of his elder brother, the Archbishop of Upsala, he entered the Church, and was an archdeacon by 1523. After the Reformation both brothers went to live in Rome, and upon the death of the Archbishop (1544) Olaus became his titular successor. Two years afterwards, Paul III. sent him to the Council of Trent, and his *Historia de Gentibus Septentrionalibus* was published in 1555. It has been translated into four modern languages and is valuable to students of the local color of that era.

MAGNUSEN, mȧg'nōō-sen, Finn (1781-1847). A Norse scholar and archæologist. He was born August 27, 1781, at Skalholt, in Iceland. He practiced law, but his strong bent toward archæological pursuits led him in 1812 to return to Copenhagen, where he devoted himself with much zeal to his favorite studies, under the direction of his distinguished countrymen Thorkelin and Thorlacius. In 1815 he obtained a chair of literature in the university. Among his earliest and most noteworthy works are his papers on the aboriginal home and earliest migrations of the Caucasian races (1818); his contributions to northern archæology (1820); the indices, glossaries, and lexicon which he compiled for the elucidation of the second and third of the Arne-Magnusen editions of the Eddas (1818 and 1828); his comprehensive translation of the Elder Edda, *Ældre Edda, oversat og forklaret* (1824); and his exposition of the same work (*Eddalæren og dens Oprindelse*, 1824-26). Among his later works, his *Runamo og Runerne* (1841) has given rise to much angry discussion; and although many of his interpretations of assumed runes have been proved to be untenable, the learning and acumen which he brought to bear on the subject of runes generally have thrown great light on this branch of archæology. In conjunction with Rafn, Magnusen elucidated the history and antiquities of Greenland in an able work (*Grönlands historiske Mindesmærker*, 1838-45); and he subsequently prosecuted a similar course of inquiry in regard to Russia in *Antiquités russes* (1850-52). In addition to these works, Magnusen annotated many of the most important remains of old northern literature, as the *Heimskringla*, *Hakonarmal*, *Laxdæla-Saga*, etc.; and besides numerous monographs on archæological and historic subjects of interest, made many valuable contributions to current Icelandic literature. He died December 24, 1847.

MAGNUSSON, mȧg'nōōs-sôn, Arni (1663-1730). A Norse scholar and antiquary, born in Iceland. After studying at home Magnusson went to Copenhagen, where he soon after received an appointment in the Royal Archives. In 1701 he became professor of philosophy and northern antiquities at the university. From 1702 till 1712 he traveled through Iceland as a member of a commission, and at this time laid the foundation of the famous collection that bears his name. It is largely owing to Magnusson's industry and enthusiasm that so much of the classical literature of Iceland has been preserved. After returning to Denmark he continued to add to his collection, at the same time making copious notes. In 1728 about two-thirds of the manuscripts were destroyed by fire. The remainder, together with Magnusson's whole fortune, were bequeathed to the university library, where they are now lodged. A complete catalogue of the collection, with a biography of Magnusson and other related matter, has been published by the present custodian, Dr. Kr. Kaalund (1888-94). Although Magnusson published some historical works, he is chiefly remembered as a collector. He died on a visit to Iceland, January 6, 1730.

MA′GO (Lat., from Gk. *Μάγων*, *Magōn*). A name common in Carthaginian history. The most famous of those who bore it was Mago, the son of Hamilcar Barca, a younger brother of Hannibal. He participated in the invasion of Italy and after the battle of Cannæ opposed the Roman armies in Spain for many years. In B.C. 206 he crossed over into Liguria, but was defeated in a battle there, and on the way home died of his wounds (B.C. 203).

MAGOF′FIN, BERIAH (1815-85). An American politician, born in Harrodsburg, Ky. He graduated at Centre College, Danville, Ky., in 1835, and at the law school of Transylvania University in 1838, after which he began to practice at Jackson, Miss. In 1850 he returned to Harrodsburg, was elected to the State Senate and became an active leader of the Union branch of the Democratic party. He was defeated for Lieutenant-Governor in 1855, but in 1859 was elected Governor for a four years' term. He was a strong advocate of the 'Crittenden compromise,' and after the actual beginning of hostilities attempted in vain to secure Kentucky's neutrality, and to prevent her citizens from taking any part in the war on either side. He refused to pay any attention to Lincoln's first call for troops, and followed his refusal by proclamations prohibiting recruiting in Kentucky for either Federal or Confederate armies. He sent public letters to both Lincoln and Davis, stating his position, and demanding that both withdraw their troops from the State. In the spring of 1862 the State Legislature passed a resolution over his veto asking him to issue a proclamation against the entrance into the State of Confederate troops. He complied, but in the following August, recognizing that his position was untenable and his power gone, he called a special session of the Legislature and resigned. He was a member of the State Legislature for several terms after the war.

MA′GOG (in the Old Testament). See GOG AND MAGOG.

MAGOG. A town of Stanstead County, Quebec, Canada, at the outlet of the river of the same name from the north end of Lake Memphremagog, 18 miles southwest of Sherbrooke (Map: Quebec, D 5). It is a favorite angling resort, has daily steamer communication with Newport, and is a station on the Canadian Pacific Railway. Population, in 1891, 2100; in 1901, 3516.

MAGOT. The Barbary ape. See MACAQUE.

MAGPIE (variant of *magotpie*, from *Mag*, *Magot*, abbreviation of *Margaret* + *pie*, OF., Fr. *pie*, from Lat. *pica*, magpie, either from *pingere*, to paint, in allusion to its spotted hue, or connected with *spicere*, to spy, and ultimately with provincial Eng. *speight*, woodpecker). Somewhat intermediate between jays and crows and closely related to both is the genus Pica, the species of which are known, wherever English is spoken, as magpies. In size and coloration magpies resemble small crows, while in many other respects they are more like the jays. Their most prominent external character is the long, graduated tail, which is sometimes longer than head and body together, and the outer feathers of which are scarcely half the length of the middle pair. The best-known species of the genus is the common magpie of Europe (*Pica pica*), of which a very closely allied form, known as the black-billed magpie (variety *Hudsonica*), is abundant in Western North America, except California, ranging as far east as Manitoba and Minnesota, and northward to the North Saskatchewan River. (See Plate of JAYS, MAGPIES, ETC.) This bird is rather more than 15 inches long and about 2 feet across the extended wings. The color is lustrous black with green, violet, and purple, sometimes even golden iridescence. The lower parts, a patch on each shoulder, and portions of the wings are white. The bill and feet are black. A very similar species (*Pica Nuttalli*) is found in California, but is easily distinguished by the bright yellow bill and naked space about the eye. Magpies generally go in pairs and are remarkable for their slyness and cunning in escaping observation. When in small flocks, they are bolder and more noisy. The cry is loud, harsh, and unmusical, but when the bird is alone it is usually silent. It is very clever in hunting and securing its food, which consists of almost anything eatable, though, like the jays, it is especially fond of eggs and young birds. On this account magpies are constantly hunted and killed by gamekeepers; but in many places these birds are encouraged to come about houses because of their bright, saucy habits, and handsome plumage.

The nest of the magpie is a most remarkable structure, nearly as large as a bushel basket, placed in thick shrubbery. The top and outside is made up of interwoven thorny branches, within which is the nest proper, composed of earth and lined with fibres and grass. There is an opening on each side so that the long tail rests in the one at which the bird enters, while it can when necessary escape at the other without turning. The eggs are from five to nine in number, pale drab, dotted, dashed, and blotched with purplish brown. The magpie is easily tamed and soon becomes very familiar and may sometimes be taught to articulate a few words, but, like the crow, it is a troublesome pet, for it is a sneak thief of the same stamp. In the Old World the common magpie occurs in Siberia as well as in most parts of Europe, and there are several other Asiatic members of the genus. The so-called 'blue magpies' are natives of the Old World and belong to the genus Cyanopolius, but they are quite as much jays as magpies. There are only two species, which are very similar, though one is confined to the Spanish Peninsula, while the other occurs in Eastern Asia and Japan. The name 'blue magpie' is also given sometimes to the very long-tailed jays of the genera Calocitta and Urocissa, the former a Central American, the latter an Oriental group. Various birds of pied plumage not magpies at all are sometimes called so, as the mottled owl, a 'magpie robin,' 'magpie shrike,' etc.

Consult: Coues, *Birds of the Northwest* (Washington, 1874), and the authorities there cited; Keyser, *Birds of the Rockies* (Chicago, 1902).

MAGRATH, mȧ-grăth′. WILLIAM (1838—). An American landscape and figure painter, born in Cork, Ireland. He had studied in his native city when he came to this country in 1855. Afterwards he lived in London, Washington, and New York City, where he was elected a National Academician in 1876. His best work is in character studies, such as "The Road to Kenmair" (1871); "The Reveille" (1873); "Rustic Courtship" (1877); and "On the Old Sod" (1879), in the Metropolitan Museum of Art, New York City.

MAGRU′DER, John Bankhead (1810-71). An American soldier, born at Winchester, Va. He graduated at West Point in 1830, and was assigned to the Seventh Infantry, but was transferred the next year to the artillery. He served at various Eastern garrisons, became first lieutenant in 1836, took part in the Florida War of 1837-38, and in the military occupation of Texas in 1845-46, and in 1846 was promoted to be a captain. During the Mexican War he was brevetted major (April, 1847) and lieutenant-colonel (September, 1847) for gallantry at Cerro Gordo and Chapultepec respectively. He was in garrison in Washington in 1861, and resigned from the National service to become colonel in the Confederate Army. His first command was that of the artillery around Richmond. After winning the battle of Big Bethel he was promoted to be brigadier-general in June, and became major-general in October. While in command of the district of Yorktown he prepared the fortifications across the Peninsula of Yorktown, and with twelve thousand men defended a line thirteen miles long against McClellan's entire army during the month of April, 1862. In the Seven Days' Battles he commanded the Confederate left wing, and attacked at Savage's Station and Malvern Hill. He was then appointed to the new Trans-Mississippi Department, but this command was reduced to Texas alone. On January 1, 1863, he recaptured Galveston, drove off the blockading squadron, and succeeded in keeping the port open. New Mexico and Arizona were added to his department. At the close of the war he joined the army of Maximilian in Mexico as major-general and served until the Empire fell. For a time he lectured on his experiences in Mexico, but settled at Houston, Texas, in 1869.

MAGUEY. Various agaves and their fibre. See Agave.

MAGUINDANAO, mä′gên-dä′nou. A Moro tribe on the Rio Grande, Cotobato Province. See Moro.

MAGUIRE, mȧ-gwīr′, John Francis (1815-72). An Irish lawyer and journalist. He was called to the bar in 1843, edited and published at Cork the Roman Catholic *Examiner*, sat in Parliament as member for Dungarvan from 1852 to 1865, and for Cork from 1865 till his death. He was a supporter of Home Rule, and was for several years Mayor of Cork. He was the author of *The Industrial Movement in Ireland* (1852); *Rome and Its Ruler* (1857; enlarged as *The Pontificate of Pius IX.*, 1870); *Father Mathew, a Biography* (1863); *The Irish in America* (1868); and *The Next Generation* (1871).

MAGYAR, mŏ′dyŏr, László (1817-64). An Hungarian traveler, born at Maria-Theresiopel (Szabadka). He was in the Austrian Navy for two years and then traveled in the United States, the West Indies, and South America from 1844 until 1847, when he left for the Portuguese colonies of South Africa. Thence he journeyed by caravan into the centre of the continent as far as Bihe, where he married a native princess and remained to make important explorations into the surrounding unknown country until 1857, when he left for Luiera Bay to establish a post between Benguela and Mossamedes for the Portuguese Government. The results of his travels were published at Budapest (1859), under the title, *Travels in South Africa in 1849-57.*

MAGYAR (Gypsy, or Hungarian) **MUSIC.** The characteristic music of Hungary, in which the Magyar and Gypsy elements in the population find expression. The following characteristic scale is undoubtedly of Asiatic origin: C, D, E♭, F♯, G, A♭, B, C. The distinctive features of Magyar music are endless variety of rhythm, absolute freedom, even abruptness, in modulation, and a profusion of embellishments. Polyphony is practically unknown, the performances consisting chiefly of improvisations upon well-known melodies, although original themes are also employed. The national instrument is the violin. The Magyar orchestra was formerly composed of various instruments, the violin and the cembalo being the principal ones. This cembalo is an oblong box with steel strings struck by two wooden mallets. To-day there are also second violins, celli, double-basses, clarinets, and trumpets. These, however, are not used as in our music, but only for the doubling of the harmonies and the accentuation of the rhythm. The principal instrument always remains the violin, and all others follow it. It is almost impossible for us to conceive how so many performers can keep together when the principal instrument practically improvises. But competent musicians who have heard the Magyar orchestra are unanimous in their admiration of the precision and fire with which everything is executed. Even as early as the thirteenth century the musicians of Hungary were famous. During the fourteenth century their assistance was considered indispensable in the celebration of all public festivals. It is on record that about 1550 Karmann reaped honors and wealth through his marvelous performance upon the violin. Michael Barun is called the 'Hungarian Orpheus.' He won the first prize at a tournament arranged by the magnates of Hungary. About 1775 Cinska Pama was regarded as the greatest violinist. The more recent of the great Magyar violinists, who also appeared in Germany, were Paticarius, Kecskeméty, Sarközy, and Bihary.

That practically nothing has been preserved of their compositions is due to the fact that they were chiefly improvisations. The peculiar embellishments, the sudden transitions, and ever-changing and complicated rhythms make actual notation exceedingly difficult. Nevertheless, the written works of Lavotta and Czermak give a good idea of the genuine Magyar music. The latter is regarded by the Hungarians as their greatest national composer, although by birth he was a Bohemian.

The musical forms of the Hungarians are very limited. The artists give themselves up to momentary inspirations. Hence the chief form would be the fantasia, which, in reality, is no form at all. The only definite artistic form we find in the national dance, the csárdás (q.v.).

Some of our great masters have been strongly influenced by the Magyar music, as Haydn, Schubert, Joachim, Brahms, and particularly Liszt, whose 15 Hungarian rhapsodies are masterly arrangements of genuine Hungarian melodies. The great pianist has also written a book, *Des Bohémiens et de leur musique en Hongrie* (Paris, 1859), translated into German by P. Cornelius, *Die Zigeuner und ihre Musik in Ungarn* (Budapest, 1861). Consult also the Appendix to Ludwig Nohl's *Allgemeine Musikgeschichte* (Leipzig, 1884).

MAGYARS. See Hungary.

MAHABHARATA, mȧ-hä′b′hä′rȧ-tȧ (Skt. *mahā*, great + *bhārata*, war or story of the Bharatas). The great epic of India, nearly eight times as long as the *Iliad* and *Odyssey* combined. Native Hindu tradition interprets its title as referring either to the great war waged by the Bharatas or to the poem itself which recounts the war. The latter is probably a later view, based on the complete epic as it has come down to us in eighteen books, containing altogether about 100,000 stanzas. Of these, some 5000 are in four-verse form of eleven syllables each (4 × 11), and the remainder, with the exception of about two hundred stanzas of more elaborate construction, in stanzas of thirty syllables. There are also short passages in prose. An improbable tradition represents this poem as having been originally much longer. More in accord with historic possibility is another tradition pointing to the fact that the Bharata poem was at first only a quarter of its present length, the poem itself being distinguished from the numerous episodes now included in it. A supplementary book on the genealogy of Vishnu, the *Harivanśa* (q.v.), is a still later addition. Like many other Hindu works, the Mahabharata is supposed to have been composed by Vyasa; but in reality it bears the marks of having been compiled by numerous revisers working over the material of the old rhapsodists and uniting this with the lucubrations of sectarian religious philosophers. The kernel of this work is an epic narrative telling how the ancient family of the Kurus (Kauravas) was overthrown, in consequence of their own wickedness, by the opposed Panchalas and Pandus (Pandavas). The last-named are the real heroes of the epic, which lauds them as faithful worshipers of the true god Krishna, the human incarnation of Vishnu (q.v.). After the genealogy of the families has been narrated in the first book, the epic action begins with an account of a gambling-match, at which the Kurus unfairly cheated the Pandus (reported to be their cousins), robbed them of their neighboring kingdom, and exiled them for twelve years. The story of the exile in the woods gives opportunity for many tales, told to while away the tedium of the banishment, after which the opposing forces, having collected their allies, meet on the sacred Plain of the Kurus and the great war (or eighteen days' battle) takes place, resulting in the overthrow of the Kurus. Though the epic properly ends here, it is prolonged, by means of philosophical and ethical discussions embracing the most minute points of social and moral observance; for 20,000 stanzas, which have nothing to do with the story itself and are in fact merely a popular exposition and summary of legal and philosophic lore. These huge additions make of the epic an encyclopædia of all knowledge with a strong bias toward religious proselytism. As compared with the Ramayana (q.v.) (the second great epic of India), the Mahabharata is mentioned earlier in Hindu literature and the scene is laid in the older seat of Brahmanic learning, at Kurukshetra and Hastinapura (q.v.), near the modern Delhi. It is probably in origin the older of the two epics, though dating in its present form from a later period than the time when the Ramayana was composed. Some sort of a Bharata war-story was probably handed down from remote antiquity in constantly changing poetic form; but the usurpation of the heroes' place by the newer house of the Pandus shows that our present version cannot be of very great antiquity, and it is likely that some of the episodes are really older than the main poem in its modern shape. The present poem appears to have been composed about B.C. 200, with extensive additions from time to time, till about A.D. 100, when it was probably almost in the condition now preserved to us, as was certainly the case three or four hundred years later. Many of the later Puranas (q.v.) are based on the story of this epic and are virtually sectarian tracts in honor of Vishnu or Siva, the two gods whose unity is proclaimed by the epic. Later classical literature also draws largely from the same source. Holtzmann's opinion that the epic dates from the Middle Ages is now given up by all scholars. Of late Dahlmann has contended that the epic was composed all at one time, perhaps even by one person, about B.C. 500. In this extreme form Dahlmann's views have proved unacceptable; though he has shown that it is not possible to reject offhand this or that portion as a later addition, and has thus put the finishing touch to the demolition of Holtzmann's theory of the construction of the poem. The composite character of the poem as shown by metre and contents has been strongly brought out by Hopkins, who argues against the extremist opinions of Dahlmann as regards both the date of the poem and its unity of composition. It is an open question whether in its earliest beginnings the Bharata poem did not record events of far greater historical importance than those now chronicled in it. Grierson holds that it originally described a conflict for the controlling power in all Northern India as waged by the earliest Aryan immigrants against those who came into the country at a later date. While it would be difficult to find support for this hypothesis in the poem itself, it is at least a reasonable theory. On the other hand, quite unsupported by any sound interpretation of history is the use made of supposed epic data by Hewitt in his recent Akkadian studies. Apart from the question of the date of the poem and of the war as now described in it, lies the question of the date of the original Bharata war, which may reasonably be referred to about the twelfth century B.C. According to Aiyer, B.C. 1194 is the date of the Kuru-Pandu battle, but this view, though ingeniously supported, ignores the fact that the Pandus were unknown at that early age. The text of the Mahabharata in its Northern recension has been published in Calcutta in four quarto volumes (1834-39), to which is added a table of contents. A better edition is that of Bombay in six volumes, with one recently added containing the Harivansa. It is stereotyped and has been reprinted several times (with the Harivansa in 1900), and has besides the text the commentary of Nilakantha. Extracts from the Southern version of the text (not radically different from the Northern) have been given by Winternitz (*Indian Antiquary*, vol. xxvii.). A complete English translation has been made by Mohan Ganguli (published by Protap Chandra Roy, Calcutta, 1883-96); and another is now appearing (M. N. Dutt, Calcutta, 1895 et seq.). There is also a French translation by Fauche and Ballin (Paris, 1870-99), which is neither complete nor accurate. Various episodes of the epic have been translated by Holtzmann, *Indische Sagen* (Stuttgart, 1854), and by Edwin Arnold, *Indian Idylls* (Boston, 1883). See also Hopkins, *India, Old and New* (New York, 1901). Summaries of the poem are furnished by Williams, *Indian Wisdom* (London, 1876); Oman, *The Great Indian Epics* (ib., 1899); and Romesh Dutt, *Mahabharata, the Epic of Ancient India, Condensed into English Verse* (ib., 1898). Technical works are: Holtzmann, *Das Mahābhārata* (Kiel, 1892-95); Bühler, *Indian Stūdies* (Vienna, 1892); Dahlmann, *Das Mahābhārata als Epos und Rechtsbuch* (Berlin, 1895); id., *Genesis des Mahābhārata* (ib., 1899); Hopkins, *The Great Epic of India* (New York, 1901); Aiyer, *The Chronology of Ancient India, First Series, Date of the Mahābhārata War* (Madras, 1901).

MAHAF′FY, John Pentland (1839—). An eminent classical scholar and historian, born at Chaponnaire, on Lake Geneva, Switzerland. He received his early education in Germany, then entered Trinity College, Dublin, where he graduated in 1859. After 1871 he was professor of ancient history in the University of Dublin. Professor Mahaffy's most important works deal with the history of ancient Greek civilization. Among his numerous publications the following may be mentioned: *Commentary to Kant's Critique* (1866); *Social Life in Greece from Homer to Menander* (3d ed. 1877); *Rambles and Studies in Greece* (2d ed. 1878); *A History of Classical Greek Literature* (2d ed. 1892); *The Story of Alexander's Empire* (1886); *The Greek World Under Roman Sway* (1890); *The Flinders Petrie Papyri* (Memoirs of the Royal Irish Academy, 1890-94); *Problems in Greek History* (1892); *The Empire of the Ptolemies* (1896); etc.

MAHĀ-KĀŚYAPA, mȧ-hä′-käsh′yȧ-pȧ, **KĀŚYAPA**, or **KASSAPA**. Name of one of the eighty great disciples of the Buddha Sākyamuni. He was originally a Brahman, but he became one of the Buddha's first converts. Buddha looked upon him as his successor, and after Buddha's death Kasyapa urged the convening of the first general Buddhist council and was instrumental in arranging portions of the canonical works of the Buddhist scriptures. There are numerous legends connected with his life. Consult: Rhys Davids, *Buddhism* (London, 1890); Kern, *Manual of Hindu Buddhism* (Strassburg, 1896); Burnouf, *Introduction à l'histoire du buddhisme indien* (Paris, 1844); id., *Le lotus de la bonne loi* (ib., 1852).

MAHAN′, Alfred Thayer (1840—). An American naval officer and author, born at West Point, N. Y. His father was D. H. Mahan, who for many years was a professor in the United States Military Academy, and whose books on military engineering had an international reputation. The son graduated at the United States Naval Academy in 1859, entered the navy as a midshipman, and was made a lieutenant in 1861. During the Civil War he saw active service in the South Atlantic and Gulf squadrons, and from 1862 to 1863 was on duty at the Naval Academy. He was made lieutenant-commander in 1865, commander in 1872, and captain in 1885. From 1886 to 1889, and again from 1892 to 1893, he was president of the Naval War College at Newport. At his own request he was retired from active service in November, 1896, but during the war with Spain served on the Naval War Board, and in the following year was one of the United States representatives to the Peace Congress at The Hague.

Captain Mahan's reputation rests chiefly upon his work as a writer. His first book, *Gulf and Inland Waters* (1883), which was contributed to a series called "The Navy in the Civil War," was not particularly successful; and it was not until 1890, when his great work, *Influence of Sea Power upon History, 1660-1783*, appeared, that he sprang into prominence. This book, which was an expansion of a course of lectures that he had delivered in the Naval War College, pointed out for the first time in a philosophic way the profound influence of maritime activity in molding the destinies of the world. It received immediate recognition both in this country and in England as a work of the utmost importance. Two years later appeared his *Influence of Sea Power upon the French Revolution, 1793-1812* (2 vols.), and his *Life of Farragut*. These were followed in 1897 by the *Life of Nelson, the Embodiment of the Sea Power of Great Britain* (2 vols.), and by *The Interest of America in Sea Power, Present and Future*. The former received unstinted praise from even the most conservative of the English reviewers, and is generally regarded as the best life of the great admiral yet published. *Lessons of the War with Spain* appeared in 1899; *The War in South Africa* and the *Problem of Asia* in 1900; *Types of British Officers Drawn from the English Navy* in 1901; and *Retrospect and Prospect*, a collection of studies of international relations, naval and political, in 1902. Mahan's other writings include many articles in the periodicals, and he assisted W. L. Clowes in writing *The Royal Navy: A History* (1897).

MAHAN, Dennis Hart (1802-71). An American military engineer. He was born in New York, and after graduating at West Point was appointed to the engineer corps of the army. In 1825 he was made assistant professor of mathematics at the United States Military Academy, where, in 1832, he became professor of military engineering. He remained at West Point in that capacity till his death, which occurred by suicide in a fit of temporary insanity. He wrote a number of text-books on civil and military engineering, which came into general use in schools and colleges in the United States. His *Treatise on Field Fortifications* appeared in 1836, and was supplemented in 1865 by *Military Mining and Siege Operations*, the two constituting parts i. and ii., respectively, of *An*

Elementary Course of Military Engineering. He also published *An Elementary Course of Civil Engineering* in 1837, which he rewrote and revised in 1868; *Advanced Guard, Outpost, and Detachment Service of Troops* (1847); *Elementary Treatise on Industrial Drawing* (1853); *Descriptive Geometry* (1864); and an edition of Moseley's *Mechanical Principles of Engineering and Architecture* (1856). A biographical memoir by Gen. H. L. Abbot will be found in volume ii. of the *Biographical Memoirs of the National Academy of Sciences* (Washington, 1886).

MAHAN, Milo (1819-70). An American Protestant Episcopal minister, brother of D. H. Mahan, born in Suffolk, Va. He was educated at Saint Paul's College, Flushing, L. I.; took orders in the Protestant Episcopal Church in 1845, and became rector of Grace Church, Jersey City, in 1848, and assistant minister of Saint Mark's Church, Philadelphia, in 1850. In 1857 he was elected professor of ecclesiastical history in the General Theological Seminary in New York. In 1864 he became rector of Saint Paul's Church, Baltimore. His published works are: *The Exercise of Faith* (1851); *History of the Church During the First Three Centuries* (1860; new ed., enlarged, 1872); *Reply to Colenso* (1863); *Palmoni: A Free Inquiry* (1864); *Comedy of Canonization* (1868). His works were collected and published, with a memoir, in three volumes, by Hopkins (New York, 1872-75).

MAHANADI, or **MAHANUDDY,** mä'hȧ-nŭd'ĭ (Skt., great river). A river of India, rising in the southern part of the Central Provinces (Map: India, D 4). It flows in an irregular eastern direction across Orissa to the city of Cuttack, where it divides into several arms, forming a large delta, through which it enters the Bay of Bengal about 100 miles southwest of the Ganges Delta. Its entire length is upward of 500 miles, and it is navigable during the rainy season about 300 miles to Sambalpur. During this season the volume of water discharged by the Mahanadi is very great; the surplus is being utilized for irrigation by an elaborate system of canals constructed by the British Government.

MAHANOY (mä'hȧ-noi') **CITY.** A borough in Schuylkill County, Pa., 10 miles north by east of Pottsville, on Mahanoy Creek and on the Philadelphia and Reading and the Lehigh Valley railroads (Map: Pennsylvania, E 3). It is situated in the anthracite region, and has extensive coal-mining and shipping interests, besides potteries, foundries, and flour, lumber, and hosiery mills. The borough is well laid out and has a public-school library. Mahanoy City was settled in 1859 and was chartered as a borough in 1863. Population, in 1890, 11,286; in 1900, 13,504.

MAHANUDDY. A river of India. See Mahanadi.

MAHARIF, mä'hȧ-rēf. An antelope of the Sudan (*Hippotragus Bakeri*), allied to the roan and sable antelopes, and standing nearly five feet high at the withers. It is of a pale liver color, with penciled ears and black stripes across the shoulders. This fine antelope, whose horns are massive, was discovered by Sir Samuel Baker.

MAHASEER, mä'hȧ-sēr. A large barbel of India and Ceylon (*Barbus tor*), which reaches a length of six feet under favorable circumstances. These great fish reside in the streams of the highlands, and form one of the principal attractions to the angler in the East. When the rainy season begins, the mahaseers ascend the hill rivers and their tributaries as far as possible, and spawn, after which they drop down with the subsiding waters. When the ova hatch the fry find themselves alone in the scanty headwaters, and safe from the devouring appetites of their now absent parents. In these small streams and pools they grow almost unmolested until the next season's high water enables them to go down stream. Thus the continued supply of this and of various other similar fishes is secured to the people of the plains. Mahaseer fishing is one of the leading sports of India.

MAHĀTMA (Skt., possessing a great soul). A name applied in theosophy (q.v.) to a class of saints who are said to refrain from entering Nirvana (q.v.) that they may help mankind by their presence on earth. As a result of their asceticism and meditation they are supposed to possess superhuman powers, by means of which they are enabled to project their astral bodies to vast distances. The idea of mahātmas is entirely theosophical. Real Oriental philosophy knows nothing of them.

MAHĀVANSA, mä'hȧ-vän'sȧ (Pali, great lineage). The title of a celebrated historical work, written in Pali, giving an account in epic form of the island of Lanka, or Ceylon, from the earliest times and the introduction of Buddhism down to the death of King Mahasena, which occurred A.D. 302, and extended later by various additions down to the time of the English occupation. Like the Dīpavansa (q.v.), the Mahavansa is derived from a more ancient source, the historical portion of the *Aṭṭakathā*, which commented on the Buddhist Scriptures after giving an annalistic record by way of introduction. An incomplete edition of the Mahavansa, with an English translation, was published by G. Turnour (Ceylon, 1837) and reissued later in revised form by L. C. Wyesinha, *Mahāwanso, Translated from the Pāli into English,* vol. i. (Colombo, 1889). Consult Geiger, *Dīpavansa und mahāvansa, die beiden Chroniken der Insel Ceylon* (Erlangen, 1901).

MAHĀVĪRA, mȧ'hä'vē'rȧ (Skt. *mahā-vīra*, great hero). Name of the founder of the sect of the Jains. (See Jainism.) He is known also as *Vardhamāna* 'the Exalted,' *Vīra* 'the Hero,' or as *Jina* 'the Victorious.' He is regarded as the twenty-fourth and last in the long list of deified masters recognized in Jainism, and he appears to have been an elder contemporary of Buddha. His birthplace was at Kotigama (now Vasakund), in Northeastern India. His legendary history is given in the *Kalpa-Sūtra* (q.v.) and the *Mahavīra-Charitra*, two works held in great authority by the Jainas. According to these works, Mahāvīra's first birth occurred at a period infinitely remote; it was as a nayasara, head man of a village, that he first appeared in the country of Vijaya, subject to Satrumardana. He was next born as Marichi, the grandson of the first Jaina saint Rishabha; he then came to the world of Brahma, was reborn as a worldy minded Brahman, and after several other births—each separated from the other by an interval passed in one of the Jaina heavens, and each period of life extending to many hundreds of thousands of years—he quitted the state of a deity to obtain immortality as a saint, and was incarnate toward the close of the fourth age, when seventy-five years and eight and one-half months of it remained. After he was thirty years of age he renounced worldly pursuits, and departed to practice austerities. Finally, he became an Arhat or Jina; and at the age of seventy-two years, the period of his liberation having arrived, 'he resigned his breath,' and his body was burned by Indra and other deities, who divided among them such parts as were not destroyed by the flames. The ashes of the pile were distributed among the assistants; the gods erected a splendid monument on the spot, and then returned to their respective heavens.

MAHĀYĀNA, mä'hȧ-yä'nȧ (Skt., Great Vehicle). The development of Buddhism (q.v.) which in the course of a few centuries after the death of Buddha became the dominant system in Northern India as well as in Kashmir and Nepal, and later still spread into China, Korea, Japan, Tibet, Mongolia, etc. Hence it is sometimes spoken of as Northern Buddhism or the 'Northern School,' as distinct from the 'Southern School' of Ceylon, Siam, and Burma, where the primitive system formulated by Gautama is still the prevailing form. The system of the Northern School is called *Mahāyāna*, 'the Great Vehicle or Conveyance,' because it is supposed to afford the means of salvation to a much larger number than can find places in the *Hīnayāna*, or 'Little Vehicle,' as the southern system is disparagingly designated by the followers of the Mahāyāna School. Under the influence of contemporary Hinduism and the Shamanistic notions and practices of the northern barbarians among whom Buddhism had begun to spread, animistic beliefs and views concerning the supernatural were introduced; Shivaitic gods and practices were adopted, the attainment of magic powers by means of occult formulas and phrases was eagerly sought, and objects of worship were multiplied. A thousand new Buddhas were invented, among them the Adi-Buddha (q.v.), who came to be worshiped in Nepal as the self-existent Supreme Being. By spontaneous acts of contemplation and wisdom each of these Buddhas projected from his own essence other intelligences, called Bodhisattva, or spiritual sons, who are represented as having reached such a stage of saintship that but one more birth was necessary for them to become Buddhas, but who had decided to forego Buddhahood, and become the guardians of the Buddhist community on earth, and to help mankind, between the death of one earthly Buddha and the appearance of the next. Each of the five earthly Buddhas of the present Kalpa or age has his spiritual counterpart, who exists in formless worlds of meditation, as a Dhyani-Buddha (q.v.), and has his reflex Bodhisattva. Three correspond to the three Buddhas who preceded Gautama, one to Maitreya, the coming Buddha (expected 2500 years hence), and one, Amitabha, represents the historical Buddha. His spiritual son is Avalokiteshvara of Padmapani, better known in China as Kwan-yin (q.v.) and in Japan as Kwan-non. It is thus evident that northern Buddhism has diverged most remarkably from the primitive system evolved by Sakyamuni. In Tibet and Mongolia, where it is known as Lamaism (q.v.), it has become the contrary of Gautama's system, and so far has celibacy been discarded that in certain Japanese sects the priests may marry.

MAHDI, mä'dê (Ar. *al-Mahdī*, the Guided One). The name given to the messenger of Allah, who is expected by certain sections of the Mohammedan world to complete the Prophet's work by converting or exterminating the infidels and by equitably dividing the world's goods. It is supposed that he will be a second Mohammed in name and in appearance; and, since the time of the Abbassides, that he will carry the black flag of the Prophet. He is to meet Jesus in Damascus and Jerusalem, and to reign seven, eight, or nine years, filling the earth with justice. The idea is not contained in the Koran; but later tradition puts the following words into Mohammed's mouth: "Even though time shall have but one more day to last, God will call up a man of my family who will fill the earth with justice, as it is now filled with iniquity." The Mahdi idea arose in the eastern part of the new Arab empire, nourished by Jewish ideas of the coming of the Messiah, and Christian ideas of the second coming of Jesus; more especially in Persia, where the idea of a Saoshyant (q.v.) or Redeemer was part of the popular tradition and the trend to mysticism and deification part of the national character. Its first manifestation was due to the anti-Arab feeling of the Persian Mohammedans who, as legitimists, gathered around Ali, the son-in-law of the Prophet, and resented his neglect in favor of the Ommiads, the bitterest opponents of the Prophet. Even during his lifetime Ali was deified, though against his will, by the Jew Abd Allah ibn Saba; and his violent death strengthened the belief that he would be awakened at the end of time and would conquer the world. By others Ali was considered simply to be the *waṣi* or vicar of the Prophet; and in the circles which regarded him as the legitimate Imam (leader) he was confounded sometimes with the Messiah, sometimes with Elijah. The subject became one of fierce dispute between the Shiites and the Sunnites. In the course of time the idea was used as a political weapon by numerous pretenders, and the Mahdi led the Holy War (*jihad*) against Moslems as well as against unbelievers. The first Mahdi was Mohammed ibn al-Hanafiyyah, son of Ali, though not of Fatima, who was proclaimed by one Mukhtar in the reign of Abd al-Malik (684-687) after the murder of Ali's son Hosein. When Mohammed died the Persians refused to believe him dead, but asserted that he would return after seventy years. The idea spread, and since then Mahdis have arisen very often among Persians, Egyptians, and the Arabs of the Sudan. One of the most famous of these was the veiled prophet Al-Mokanna (see HAKIM IBN ALLAH), the subject of Moore's poem, who came to be regarded as divine and was worshiped for centuries. A large number of Shiites believe that there have existed only twelve Imams. When the twelfth died at Samarra (941), a child of twelve years, it was held that from that time on the Imam would remain concealed, though he may arise as Mahdi at any moment. Of the Egyptian Mahdis, the mad Hakim (996) is most notorious. He also disappeared, but that he will appear again is the firm conviction of the Druses (q.v.) in the Lebanon Mountains and the Hauran. Of the sects that have sprung from this idea, the Ismailis may be mentioned, who expect the return of a Mahdi, Mohammed ibn Ismail of the family of Ali. The Karmathians also took their origin from this idea. (See MOHAMMEDAN SECTS.) Even orthodox Islam has been affected, and had its Mahdi in the person of Ibn Tumart (1121), the founder of the Almohade Berber power.

The modern Mahdi is a product of one of the many religious orders (the Sammaniyyah) which, as a protest against the encroachment of the Christian civilization, honeycomb the Moslem world, and are especially numerous in Northern Africa. Born in 1844 or 1848 in the Province of Dongola, he took the name Mohammed Ahmed, asserting that his father was descended from Hosein and his mother from Abbas. He studied at Kereri, four miles north of Omdurman, at Khartum and in Berber. In 1870 he allied himself with the Sammani order, passing part of his time with his uncle, a shipbuilder on the island of Aba in the White Nile, where he lived an ascetic life. He then entered a minor order at Musallemia on the Blue Nile. In these circles the year 1882 (A.H. 1300) was supposed to be the Mahdi year. Mohammed soon became famous in the country between the White and the Blue Niles. He was joined in Kordofan by a Bakkara Bedouin named Abd Allah, who afterwards became his Caliph. He was proclaimed Mahdi in El-Obeid in 1880, but returned to Aba to continue his ascetic life. In May, 1881, he came forward openly and sent circulars to the chiefs of Islam preaching the Jihad, or Holy War, the conversion of all unbelievers, a return to the simple faith of the Prophet, simplicity in dress and manners, and a sort of social communism and asceticism. Afraid of the Egyptian Government, he collected a band of Dijem and Kinaru Bedouins and proclaimed the Jihad. In July, 1881, a small expedition sent against him was destroyed on the island. Imitating the Prophet, he left Aba, his Mecca, and came to Masa in Southern Kordofan, which he proclaimed his Medina. For his subsequent movements, see SUDAN. He died of smallpox. Consult: Darmesteter, *The Mahdi* (New York, 1885); G. Hoffmann, *Mahdithum* (Kiel, 1899); Snouck Hurgronje, in *Revue Coloniale Internationale* (1886); Ernst Müller, *Beiträge zur Mahdilehre des Islams* (Heidelberg, 1901).

MAHÉ, mȧ'hȧ'. The principal island of the Seychelles (q.v.).

MAHÉ. A French town and colony in India, at the mouth of the Mahé River on the west coast, five miles south of Tellicherri. It is of little commercial importance (Map: India, C 6). It was settled in 1722 and was taken by the English in 1761 and again in 1779; it was finally restored to France in 1815. Area, 2 square miles; population, in 1896, 9978.

MAHICAN, mȧ-hē'kȧn (American Indian, Wolf). An important Algonquian tribe or confederacy formerly occupying most of the Hudson River Valley and extending eastward into Massachusetts. They were closely connected with the Delaware and Munsee on the south and with the Mohegan and Wappinger on the east, all of these being known collectively to the French as *Loup*, or Wolf Indians. When first known their council fire was at Schodac, on an island near Albany, and their territory contained some forty villages. In consequence of the inroads of the Iroquois they removed their capital in 1664 to Westenhuck, the modern Stockbridge, Mass. By successive sales and removals, as the white settlements pressed upon them, they lost their territory and tribal identity, most of them becoming merged with the Delaware. In 1736 those remaining in western Massachusetts were gathered into a mission at Stockbridge, and became known as the Stockbridge Indians. They are the only Mahican who have preserved their identity. A few others remained about their ancient homes on the Hudson for some years after the Revolution, but finally disappeared unnoticed. Those of Stockbridge removed later to the Iroquois country in New York, and are now settled, together with a part of the Munsee, upon a reservation near Green Bay, Wis., the combined tribes numbering about 550, all completely civilized.

MAHI KANTHA, mä'hē kän'thȧ. The collective name given to thirty-nine native States of Gujarat, India, grouped under a political agency attached to Bombay. Their combined area is 9300 square miles, of which the chief State, Idar, occupies nearly one-half. The region, inhabited chiefly by aboriginal Bhils and Koils, is sparsely productive, and suffered severely during the famine of 1899-1900. A railway opened in 1897 extends from Ahmedabad to Ahmednagar. Population, in 1891, 581,568; in 1901, 361,508.

MAHIM, mȧ-hēm'. A town and railway station of the island of Bombay, seven miles north of the city of Bombay, situated on the south side of the channel separating the island from Salsette at the point where they are connected by a causeway (Map: India, B 5). The passage is commanded by a fort. The town is inhabited chiefly by Christians of Portuguese descent, who have a church and other relics of former prosperity. The only orphanage in the province, a Scotch institution founded in 1859, is located here. The inhabitants are chiefly employed in fishing, the place being famous for its oysters. Population, 9000.

MAHINDA, mȧ-hĕn'dȧ. The apostle who introduced Buddhism into Ceylon in the third century B.C. He is said to have been a son of Asoka (q.v.), and his birthplace was the town of Vedisa-Magara (now Besnagar) in the Province of Ujjain, Western India, of which his father was viceroy at the time. He was thirty-two years of age when he set out on his mission to Ceylon, accompanied by other Buddhist missionaries; and it was his sister who is said to have brought the branch of the sacred Bo-tree (q.v.) to Ceylon. His death occurred at a place not far from Anuradhapura, at the age of sixty, B.C. 193.

MAHLER, mä'lẽr, GUSTAV (1860—). An Austrian musical conductor and composer, born at Kalischt, Bohemia. He studied at the Iglau Gymnasium, and in 1877 went to Vienna, where he became a student at the university and at the conservatory. After graduation he acted as conductor of various theatres at Cassel (1883-85); at Prague, as Anton Seidl's successor (1885-86); at Leipzig (1886-88); at the Royal Opera, Budapest (1881-91); at Hamburg (1891-97); and in the latter year became director of the Court opera at Vienna. His compositions are not remarkable, though his many songs have been well received. Of his larger works a symphony in C minor is the best.

MAHLMANN, mäl'mȧn, Siegfried August (1771-1826). A German poet, born and educated at Leipzig. He traveled as tutor until 1798; became editor of the *Zeitung für die elegante Welt* (1805), and of the *Leipziger Zeitung* (1810); wrote clever burlesques, including *Herodes vor Bethlehem* (1803), a satire on Kotzebue's *Hussiten vor Naumburg*, and *Marionettentheater* (1806). His best known productions are his lyrics, of which some are still popular in Germany. Mahlmann's *Erzählungen und Märchen* were published in 1802, and his collected works in 1839-40.

MAHLSTICK, mäl'stĭk (Ger. *Mahlstock*, *Malstock*, painting-stick, from *malen*, to paint + *Stock*, stick), or Rest-Stick. A round staff, from three to four feet long, tapering toward one end, which terminates in a small ball, sometimes covered with buckskin to prevent injury to the picture against which it rests. The mahlstick is held in the painter's left hand, to support the right hand, with which he holds his brush when painting. It was formerly more generally used than at present, as it is now thought to restrict the freedom of touch in painting.

MÄHLY, mā'lė, Jakob (1828-1902). A Swiss classical philologist and poet, born at Basel. He studied at Basel and Göttingen, and afterwards became docent and professor of classical philology at the university of his native town. His works include: *Sebastian Castellio* (1862); *Angelus Politianus* (1864); *Geschichte der antiken Litteratur* (1880); *Richard Bentley* (1868); the epic poem *Mathilde* (1854); and excellent translations of Euripides, Æschylus, and Plutarch.

MAHMUD, mȧ-mo͞od'. The name of two sultans of Turkey. Mahmud I. (1696-1754) was Sultan from 1730 to 1754. His reign was of no especial importance.—Mahmud II. (1758-1830) was Sultan from 1808 to 1839. He was a younger son of Abd-ul-Hamid I., and on the deposition of his brother, Mustapha IV., by Bairaktar, Pasha of Rustchuk, was raised to the throne, August 1, 1808. Bairaktar became his Grand Vizier, and aided him in his attempts to reform the organization of the Turkish army. The Janizaries, emboldened by their successful opposition to the same attempt on the part of Selim III., rose in rebellion, and the murder of the Vizier put a stop for the time being to the carrying out of any military reforms. Mahmud was also attacked by the rebels, but he secured his life and throne by the death of Mustapha, thus making himself the sole representative of the House of Osman, upon the continuance of which its followers believe the Empire to depend. The Ottoman Empire was in a critical condition, threatened by Russia, and by rebellious vassals within its own borders. After a conflict, which completely prostrated the strength of Turkey, peace was concluded with Russia in 1812 at Bucharest, the Russian frontier being advanced to the river Pruth. Mahmud now applied himself to the promotion of radical reforms in all departments of the Government. Ali Pasha, the rebellious Pasha of Janina, was overthrown in 1822. Greece revolted in 1821, and its independence was secured by the battle of Navarino in 1827, but it was not recognized as a separate kingdom by Turkey till April, 1830. During the progress of the Greek Revolution, Mahmud had been steadily though secretly maturing his plans of military reform, and in June, 1826, the success of his schemes was crowned by the destruction of the Janizaries (q.v.), after which the army was reorganized on the European model and military schools were established. The consequent confusion into which Turkey was thrown was immediately taken advantage of by Russia for obtaining fresh concessions. Mahmud, however, despite these interruptions, proceeded in those plans of reform which he judged essential to the stability of the Empire; and the disastrous termination of the war with Russia (1828-29) (see Adrianople), far from interfering with his projects, only stimulated him to renewed exertion. Meanwhile the frequent unsuccessful wars, together with the disaffection manifested by the Christian population of Turkey, aroused in the mind of Mehemet Ali, Pasha of Egypt, the hope of achieving his independence. (See Mehemet Ali.) The Egyptian army, under Ibrahim Pasha, overran Syria in 1831-32, and advanced through Asia Minor, winning a great victory at Konieh. The intervention of Russia compelled both parties to agree to a treaty (1833) which was satisfactory to neither. Mahmud, however, was forced to grant fresh concessions to the Czar, in return for the Russian aid, by the Treaty of Unkiar-Skelessi, July 8, 1833. He again pursued with undiminished vigor his reforms in the administration, the principal improvements being the modification and readjustment of the more oppressive taxes, and the granting of increased privileges to foreign merchants. In 1839 he renewed the war with Mehemet Ali, but died on July 1st, before he had heard of the decisive defeat of his army at Nizib, June 24th. See Turkey.

MAHMUD OF GHAZNI, gäz'nė. A Mohammedan ruler and conqueror. See Ghaznivides.

MAHOGANY (from South American *mahogoni*, the native name). The timber of a number of trees, the most highly esteemed being that of Swietenia Mahogani, a large tree of the natural order Meliaceæ, native of the West Indies, Central and tropical South America. The tree attains a height of 60 to 100 feet, and a diameter of 6 feet or more, but these dimensions are not common. The former supplies of Cuba, Jamaica, and other islands of the West Indies are greatly reduced, and Central America furnishes the commercial demand. As occasional specimens the tree is met with in the extreme south of Florida, but not of a size or abundance to be of much economic value. The tree has compound leaves with usually four, sometimes three or five, pairs of leaflets, and panicles of small white or yellowish flowers that sometimes turn reddish. The wood is rich reddish brown, varying widely in its shades and markings and capable of receiving a high polish. The tree varies greatly in its rate of growth, being most rapid upon rich moist soils, but here the timber is frequently of coarser grain than when grown more slowly upon less fertile soils. The character of the timber produced in different countries varies. That from Santo Domingo (also known as Spanish mahogany) and Cuba is considered the best, and that from Honduras not so valuable, because it is less finely grained and marked. The cutting and removing of this timber to the coast for export gives employment to a large number of men and oxen. The logs as exported are usually squared so as to get rid of as much of the less valuable sapwood as possible, and also to admit of better conveyance. Formerly mahogany was largely used in ship-building, especially in the Spanish navy, but it is now almost entirely a cabinet-maker's wood, entering into manifold uses either solid or as a veneer. Mahogany was introduced into England by Sir Walter Raleigh in 1597, it having been used in the repair of one of his ships; but while the wood was greatly admired, it did not become an article of commerce until about one hundred and fifty years later. Two other little known species, Swietenia angolensis and Swietenia humilis, occur in Central America. In India, Cedrela Toona, a valuable tree of the same natural order as Swietenia, is called mahogany. Its timber is quite like the true mahogany. In Australia the name mahogany is applied to the timber of a number of species of Eucalyptus (q.v.). In the Western United States Cercocarpus ledifolius is called mountain mahogany and Cercocarpus parvifolius valley mahogany. There are also several varieties of the latter. These trees belong to the natural order Rosaceæ, and are found from Colorado to New Mexico and westward to California. The East Indian mahogany is the timber of the rohuna tree (Soymida febrifuga), and the African mahogany that of Khva Senegalensis, both belonging to the same natural order as the true mahogany.

MAHOMET'S COFFIN. According to an old legend, the Prophet's coffin in the tomb at Medina was suspended in the air, upheld, according to the faithful, by four angels who are relieved hourly. Another version of the fable describes the coffin as made of iron and held in the air by powerful magnets.

MAHÓN, mȧ-hōn′. The chief town of the island of Minorca. See Port Mahón.

MAHONE, mȧ-hōn′, William (1826-95). An American soldier and legislator. He was born in Southampton County, Va., graduated at the Virginia Military Institute in 1847, and became a civil engineer. On the outbreak of the Civil War he joined the Confederate Army, and assisted in the capture of the Norfolk Navy Yard; participated in most of the battles of the Peninsular and Rappahannock campaigns; was distinguished for bravery at Petersburg, where he earned the title 'The Hero of the Crater;' became a major-general and commanded a division. After the war he became president of the Norfolk and Tennessee Railroad, took an active interest in politics, was an unsuccessful candidate for the Democratic nomination to the Governorship of Virginia in 1878, became the recognized leader of the 'Readjusters,' a Democratic faction which favored a partial or conditional repudiation of the State debt (see Readjusters), and in 1880 was elected largely by this faction to the United States Senate. He here took the unexpected course of allying himself with the Republicans, and thus brought about a tie in place of the slight Democratic majority which had been anticipated. He further alienated his constituents by his use of the Federal patronage in Virginia which had been assigned to him by President Arthur, and at the expiration of his term in 1887 he failed to secure a reëlection.

MAHO'NIA. A genus of shrubs closely related to the barberry (q.v.).

MAHO'NY, Francis Sylvester (1804-66), best known by his pseudonym of Father Prout. An Irish poet and humorist. He was born in Cork. His father wished him to prepare for the bar, but he chose the Church, and, after studying in Paris and at Rome, was admitted to the Order of Jesuits. He was appointed prefect of studies and afterwards master of rhetoric in the Jesuit College at Clongoweswood, Ireland; but, becoming involved in a misadventure, was obliged to resign his position, and, returning to Italy, was excluded from the Jesuit Society. He then entered the priesthood, but clerical life was not congenial, and he devoted himself to literature and journalism. He began in 1834 to contribute to *Fraser's Magazine* a series of papers which were afterwards collected and published in book form as *The Reliques of Father Prout.* They comprised sketches in prose and verse ("The Bells of Shandon" being the best known), parodies, playful translations into Greek, Latin, and French, or from other languages. He contributed to *Bentley's Miscellany,* and furnished an inaugural ode to the first number of the *Cornhill Magazine.* He was the first Roman correspondent of the London *Daily News,* and was Paris correspondent of the London *Globe* for several years after 1858. The last two years of his life were passed in a monastery. The *Reliques of Father Prout* was included in Bohn's Illustrated Library in 1860. Another volume, *Final Reliques,* was edited by Douglas Jerrold and published in 1876. *The Works of Father Prout,* edited by Charles Kent, were published in 1881. *Facts and Figures from Italy* (1847) was made from his Roman letters to the London *Daily News.*

MAHRA, mä′rȧ, **MAHRI,** or Ehkili. A tribe of Hadramaut in Southern Arabia. They are of interest as representing, according to several authorities, the ancient Himyarites. This gives them an importance outside their numbers and their primitive (or perhaps degenerate) culture. Their language seems related to that of the Himyarites. Consult: Van den Berg, *Hadramout* (Paris, 1886; Eng. trans. London, 1887); Hirsch, *Reisen in Süd-Arabien, Mahra-Land und Hadramut* (Leipzig, 1897); Bent, *Southern Arabia* (London, 1900).

MAHRATTAS, mȧ-rȧt′tȧz. A people inhabiting Central India, south of the Ganges from Gwalior to Goa. They are a mixed people, speaking a Hindu language, the Marathi (q.v.), and are Hindus in religion. The Mahrattas are a vigorous and active race, possessed of great endurance, and distinguished for military courage, with which cruelty has been combined. They seem to have entered India prior to the Mohammedan conquests by Mahmud of Ghazni at the beginning of the eleventh century. The founder of the Mahratta power was Sivaji, a freebooter or adventurer, whose father was an officer in the service of the last King of Bijapur. By policy or by force he eventually succeeded in compelling the several independent chiefs to acknowledge him as their leader, and with the large army then at his command, he overran and subdued a large portion of the Emperor of Delhi's territory. In 1674 Sivaji was formally proclaimed Maharaja of the Konkan. He organized and levied a species of blackmail on his neighbors, called *chauth* (Skt.

caturtha, 'four'), a fourth of the land revenues. Sivaji's son, Sambaji, succeeded him in 1680, and after vigorously following out his father's policy was taken prisoner by Aurungzebe (q.v.) in 1689, and put to death. The incapacity of the subsequent rulers gave free rein to the intrigues and ambitions of their Brahman prime ministers or *peshwas*. (See PESHWA.) Soon the Peshwa became the hereditary sovereign, Sivaji's descendant being degraded to the position of a titular monarch. In this respect Mahratta history is of special interest as presenting a struggle between the priestly and warrior castes, with the victory finally won by the Brahmans. Early in the eighteenth century five Mahratta States were formed—Baroda, Gwalior, Indore, Nagpur, and the Peshwa's dominions (the capital of which was Poona). The usual internecine wars followed, and ultimately the East India Company was compelled to interfere. The invasion of the Empire of Delhi by the Persian Nadir Shah in 1739 afforded the Mahrattas an opportunity, of which they eagerly availed themselves, to wrest additional territory from the Mogul Emperor. From this time they discharged the office of arbiters in the quarrels between the Emperor, his Vizier, and his rebellious subjects; but the defeat they sustained in January, 1761, at the hands of Ahmed Shah, the ruler of Afghanistan, on the field of Panipat, greatly weakened their power for a time. The wars between the British and the Mahrattas began in 1779 during the administration of Warren Hastings. The Mahratta War of 1803-05 was marked by the brilliant victories of Wellesley, Lake, and others over the armies of Gwalior, Indore, and Nagpur, and resulted in large acquisitions of territory by the British. In 1817 the Peshwa of the Mahrattas took up arms against the British, who were also attacked by the Raja of Nagpur and by the ruler of Indore. The British speedily broke the power of the enemy and annexed the Peshwa's dominions to the Presidency of Bombay. Indore became a vassal State of the British, who at a later period annexed Nagpur. The Mahratta State of Gwalior, which had risen to great power in the eighteenth century, came under British control in 1843-44. The three Mahratta States of Indore, Gwalior, and Baroda refrained from participation in the Sepoy Mutiny of 1857. The ruler of Indore bears the name of Holkar (q.v.), that of Gwalior is called Sindia (q.v.), and that of Baroda is known as the Gaekwar (q.v.). See Grant-Duff, *History of the Mahrattas* (Bombay, 1863).

MÄHRISCH-OSTRAU, mä′rĭsh ō′strou. A town in the Crownland of Moravia, Austria, on the Ostrawitza, a tributary of the Oder, 60 miles southwest of Cracow. Its manufactures are varied and include iron, malt, tin, zinc, bricks, paraffin, soap, and rosoglio, petroleum, and rum. In the vicinity are the large Rothschild Iron Works of Witkowitz. The coal-mining and the coke industry are also important, and employ more than 25,000 men (in the community). Population, in 1890, 19,243; in 1900, 30,125.

MAHWA, mä′wȧ. A tropical tree. See BUTTER-TREE.

MAI, mī, ANGELO, Cardinal (1782-1854). A distinguished antiquary and philologist. He was born in the village of Schilpario, in Lombardy, March 7, 1782. He was educated and lived till 1808 in establishments belonging to the Jesuits, but obtained an appointment, first as associate and ultimately as a doctor, in the celebrated Ambrosian Library at Milan. In 1813 he published a translation and commentary of Isocrates, *De Permutatione;* but his reputation is due much more to his publications of the palimpsests or rewritten manuscripts, the first specimens of which he issued at Milan. (See PALIMPSEST.) His earliest publications in that line were fragments of *Cicero's Orations;* of the *Vidularia*, a lost play of Plautus; of *Letters of Fronto*, Marcus Aurelius's preceptor; the *Chronicon* of Eusebius, and other less important works, which, however, were entirely eclipsed by his well-known edition and restoration of the *De Republica* of Cicero, published in 1820. Meanwhile, Mai had been invited to Rome by Pius VII., and named chief keeper of the Vatican Library. He at once turned his attention to the unedited manuscripts of the Vatican, and after a short examination of this noble collection, undertook, as the mission of his life, the task of publishing those among them which had been overlooked by earlier editors, or had escaped their notice. This task he steadily pursued; and although he was appointed in 1833 to the onerous office of secretary of the propaganda, and, in 1838, to the cardinalate itself, his Roman publications form a collection of an extent and importance almost unexampled in modern times. His first series was in ten 4to volumes, entitled *Scriptorum Veterum Nova Collectio, e Vaticanis Codicibus Edita* (Rome, 1825). It consists, like the great collections of Mabillon, Montfaucon, D'Achery, and others, of miscellaneous unpublished works, partly sacred, partly profane, and indifferently in the Greek and the Latin languages, comprising an entire volume of palimpsest fragments of the Greek historians Polybius, Diodorus, Dion, Dionysius, and others. The succeeding collections, viz. *Classici Auctores ex Codicibus Vaticanis* (10 vols. 8vo, 1838); *Spicilegium Romanum* (10 vols. 8vo, 1839-44); and *Nova Patrum Bibliotheca* (6 vols. 4to, 1853), are all on the same plan, and all equally replete with new and interesting materials.

MAIA (Lat., from Gk. **Μαῖα**). In Greek mythology, the daughter of Atlas by Pleione, a daughter of Oceanus. She became the mother of Hermes by Zeus. On account of the similarity of name she was identified by the Romans with Maia Majestas, an ancient Italian spring-goddess, who was also called Bona Dea, Ops, and Fauna. In this aspect she was regarded as Vulcan's wife, and a pregnant sow was sacrificed to her on the first of May. This name is also given to the star 20 Pleiadum.

MAIDEN, THE. A name given to a machine for beheading criminals, which was in use in Scotland from about the middle of the sixteenth century to nearly the end of the seventeenth century. It is said to have been introduced into Scotland by the regent Morton; but he was not its first victim, as is popularly stated. Fifteen years before he was put to death by it (1581) it was employed to behead Thomas Scott of Cambusmichael, one of the murderers of Rizzio. It was first called indifferently 'the maiden' and 'the widow.' A frightful instrument of punishment used in Germany in the Middle Ages was called 'the virgin.' But it had no resemblance to the maiden, which was similar to the French guillotine (q.v.), although it had no turning-plank on which to bind the criminal.

MAIDEN ASSIZE. A session of the English Court of Assize at which the justice takes his seat of office, and immediately adjourns without hearing any trials. It is customary for the sheriff of the county to present the judge with a pair of white gloves as a symbol of the untried character of his administration. See Assize.

MAIDENHAIR (*maiden* + *hair*, so called from the shape of the stalks), *Adiantum capillus veneris.* A small, delicate, and graceful fern, with bipinnate fronds, alternate obovate and wedge-shaped membranaceous pinnules on capillary stalks. It grows on moist rocks and old walls, especially near the sea in the south of Europe, where it covers the insides of wells and the basins of fountains with a tapestry of the most delicate green. It is probably native in places in the United States. Another species of the same genus, Adiantum pedatum, a native of North America, with pedate leaves, has a sweet, fragrant rootstock, from which capillaire is made. One of the most popular ferns in house culture is the Adiantum Farleyense. The name is also given to species of spleenwort (*Asplenium*), one of which is shown on the Colored Plate of Ferns.

MAIDENHAIR TREE, *Ginkgo bibola.* See Ginkgo; Gymnosperms.

MAIDENHEAD, mā'd'n-hĕd. A market-town in Berkshire, England, situated amid beautiful scenery, on the Thames, 26 miles west of London (Map: England, F 5). It carries on some trade in meal, malt, and timber. It is an ancient town, formerly known as Maidenhythe. Its charter was granted by Henry VI. and in 1578 it was made a free borough. It owns remunerative real estate and a large recreation ground, and maintains a bathing establishment, isolation hospital, and sewage farm. Population, in 1891, 10,607; in 1901, 13,000.

MAIDEN QUEEN. A title given to Queen Elizabeth of England.

MAID MARIAN. A maiden presumably of French origin, the traditional female companion of Robin Hood, the legendary English outlaw. Later she is represented as one of the characters in the famous Morris dance (q.v.), which formed one of the essential features in all the principal village festivities during the reign of Henry VIII. of England. Maid Marian was personated originally by a boy in girl's clothing, and was called queen of the May, as this dance was one of the sports of May Day, Holy Thursday, weddings, etc. See Hood, Robin.

MAID'MENT, James (1795?-1879). A Scottish antiquary, born in London. He was called to the Scottish bar in 1817, and soon gained reputation as an advocate in peerage cases and in general practice. In consequence of his interest in antiquarian researches, he became known to Scott, and an intimate friendship followed. He died at Edinburgh, October 24, 1879. Among his many publications are: *Reliquæ Scoticæ* (1828); *Analecta Scotica* (1834-37); *Bannatyniana: Notices Relative to the Bannatyne Club* (1836): *Edinburgh Portraits* (1837); *Scottish Elegiac Verses* (1842); *Scottish Ballads and Songs* (1859): *A Book of Scottish Pasquils* (1868); and, with W. H. Logan, the *Dramatists of the Restoration* (14 vols., 1877). Maidment also gathered a library of rare books, the sale of which took fifteen days (1880). Consult Stevenson, *Bibliography of Maidment* (Edinburgh, 1883).

MAID OF ARTOIS, The. An opera by Balfe (1836) with libretto by Alfred Bunn. It introduces the song "The Light of Other Days," said to have been the most popular song of its time in England.

MAID OF ATHENS. A well-known poem by Lord Byron, written in Athens and said to have been inspired by Theresa Macri, the daughter of the English vice-consul.

MAID OF BATH, The. (1) A title given to Miss Linley, afterwards the wife of Richard Brinsley Sheridan. (2) A farce by Foote (1711), in which, in the character of Flint, he pilloried Walter Long for his treatment of Miss Linley.

MAID OF KENT. A name frequently given to Elizabeth Barton (q.v.).

MAID OF ORLÉANS. See Joan of Arc.

MAID OF THE MIST. (1) A name given to the heroine in Scott's *Anne of Geierstein.* (2) A small steamboat once used on the Niagara River, between the Falls and the Whirlpool Rapids, to carry visitors close to the cataract. In 1867, in order to avoid seizure by the sheriff, she made the dangerous trip through the Rapids with only slight injury.

MAID'STONE. The county town of Kent, England, and a municipal borough, on the Medway, 34 miles east-southeast of London (Map: England, G 5). It is built on the slopes of a picturesque valley on the east bank of the river, which is spanned by a handsome bridge. The principal buildings of interest are the ancient collegiate Church of All Saints, the College of All Saints, both dating from the fourteenth century, and the sixteenth-century manor house, in which a museum is located. The municipality maintains free libraries, schools of science and art, art galleries, museums, parks and recreation grounds, public baths, labor bureau, a corn exchange, concert hall, and hospital. It also owns considerable remunerative real estate. Sewage is chemically treated for fertilizing purposes, and there is a refuse destructor in conjunction with an electric lighting plant. Maidstone is the centre of a large agricultural and hop-growing district, and its industries include breweries, oil mills, and paper mills. It was the Saxon Medwegestun. It witnessed the defeat of the Kentish royalists by Fairfax in 1648. Population, in 1891, 32,150; in 1901, 33,500. Consult: Russell, *History of Maidstone* (London, 1882; new ed. 1885); Gilbert, *History of the Collegiate Church of All Saints* (Maidstone, 1866); and Cave-Browne, *Maidstone* (London, 1889).

MAID'S TRAGEDY. A play by Beaumont and Fletcher, written not later than 1611 and printed in 1619. The fourth and fifth acts are mainly by Fletcher. The forsaken maid is Aspasia, betrothed to Amintor, who deserts her for Evadne, at the command of his prince.

MAIDU (mī'dōō) **PEOPLE.** A group of small tribes, of which the Concow were the best known, in a very low stage of culture, formerly living along the eastern affluents of the Upper Sacramento River in northern California, where a small remnant still exists. They went nearly naked, lived chiefly upon acorns and piñons, with the raw blossoms of red clover in summer, and built a species of hogân or dugout of boards, with wicker granaries for storing acorns, and large round town houses for public ceremonials. They had a number of dances, the chief of which was the acorn dance, and a peculiar secret society into which boys were initiated at the age of about twelve years. They constituted a distinct linguistic stock known as the Pujunan. A few are now gathered upon the Round Valley Reservation. They are basket-makers, but fashion simpler designs than the neighboring Pomo tribes.

MAIGNAN, mȧ'nyäɴ', Albert (1844—). A French historical and landscape painter. He was born at Beaumont (Sarthe), December 15, 1844, and studied under Noël and Luminais. He received a first-class medal at the Salon of 1879, and the cross of the Legion of Honor in 1883. Among his best-known works are: "Dante Meeting Countess Matilda" (1881), in the Luxembourg; "Assault on Pope Boniface VIII. at Agani," in the Metropolitan Museum, New York.

MAIGRE. A fish. See Meagre.

MAIKOFF, mī-kôf', Apollonius Nikolaievitch (1821-98). A Russian poet, born in Moscow. He was the son of a painter and was educated at the Saint Petersburg University. He was made a Government censor of foreign publications and became a Panslavist. He translated Neo-Greek and old Slavonic poems, published a volume of original verse in 1842, and two lyrical dramas, *Tri Smerti* (Three Deaths), and *Dva Mira* (Two Worlds), and such epics as *Savonarola, Clermont Cathedral, The Queen's Confession,* and *The Princess,* which was his best effort. His complete works were published in Saint Petersburg (3 vols., 4th ed. 1884).

MAIKOP, mī'kŏp. A town in the territory of Kuban, Caucasia, situated on a tributary of the Kuban, 93 miles southeast of Ekaterinodar, the capital (Map: Russia, F 6). It is a growing town of recent origin and carries on a brisk trade in the agricultural products of the fertile region in which it is situated. Population, in 1897, 34,191.

MAILÁTH, moi'lät, János, Count (1786-1855). An Hungarian poet and historian, born at Pesth. He studied at Erlau and Raab, and was for a time chancery councilor at Pesth. This post he lost in 1848, and after seven years of literary labor at Vienna and Munich committed suicide by drowning, with his daughter, in the Starnberger See. His works include: *Gedichte* (1824); *Magyarische Sagen und Märchen* (1825; 2d ed. 1837); a translation of some of Kisfaludy's poems (1829); a valuable edition of the Kalocsa Codex, containing several poems in Old High German; and the historical works: *Der ungarische Reichstag von 1830* (1831); *Geschichte der Stadt Wien* (1832); and the *Geschichte der Magyaren* (1828-31), the most valuable of his productions, with two supplementary volumes (1854).

MAILDUN, mäl'dōōn. The hero of an ancient Irish romance known as *The Voyage of Maildun.* It is one of a group of Imrama or voluntary sea expeditions, of which the *Voyage of Saint Brendan* (q.v.) is equally well known. Maildun was the son of Ollil Ocar Agar, an illustrious man of the tribe of Owenaght of Ninus, in the County of Clare by the sea. Before the hero's birth, his father had been slain by a band of robbers who had come over the sea. When Maildun had grown up, he set forth in a triple-hide curragh (a canoe made of a framework of wood covered with skins) in search of his father's murderer. In his voyage on the western sea for three years and seven months, he visited the island of huge ants, red-hot animals, burning places, the isle of the blest, and other marvelous places. He found his enemy, whom he forgave for the hospitality accorded him after so many perils. The story is beautifully told by Tennyson in the *Voyage of Maeldune.* For a prose translation, consult Joyce, *Old Celtic Romances* (2d ed., London, 1894).

MAILLART, mȧ'yär', Louis Aimé (1817-71). A French composer, born in Montpellier. He was a pupil of the Paris Conservatory, and won the Prix de Rome for composition in 1841. His first opera, *Gastibelza* (1847), was very successful; his other works include: *Le moulin des tilleuls* (1849); *La croix de Marie* (1852); *Les dragons de Villars* (1856); *Les pêcheurs de Catane* (1860); and *Lara* (1864), all of which were presented in Paris.

MAILLET, mȧ'yȧ', Jacques Léonard (1823-94). A French sculptor, born in Paris. He was a pupil of Pradier, and won the Prix de Rome in 1847. His "Agrippine et Caligula" (1853) was the first of his groups to win recognition. His "Primavera della vita" was at the exposition of 1855, and his other works include: "Agrippine portant les cendres de Germanicus" (in the Garden of the Luxembourg), which was in the Exposition of 1867, and "Le satyre et l'amour," shown in the Exposition of 1878. There are decorative groups by him on the New Louvre, the Opera House, and in the churches of Sainte Clotilde, Saint Leu, and Saint Séverin in Paris. He also erected a monument to the Bonaparte family at Ajaccio.

MAIL-SHELL. A chiton. See Chiton.

MAIMANA, mī'mȧ-nä'. A town of Afghanistan. See Maimene.

MAIMATCHIN, mī'mȧ-chĭn'. A trading settlement of Chinese Mongolia, situated on the frontier of Siberia, opposite Kiakhta (q.v.). It is surrounded by a strong palisade and has two fine temples. Its commercial importance has decreased, together with that of Kiakhta. Only a small part of the population is permanent, most of the inhabitants being Chinese merchants, who come there on business. The current language is a mixture of Chinese and Russian.

MAIMBOURG, mäɴ'bōōr', Louis (1610-86). A Roman Catholic historian and polemical writer. He was born in Nancy, France, and became a Jesuit in 1626. As he was an earnest Gallican, the Pope in 1682 secured his dismissal from the Jesuit Order. He died in Paris, a pensioner of Louis XIV., August 13, 1686. His historical works appeared in Paris in twelve volumes in 1686; his polemical works against Protestantism in 1682. English translations were made of *The History of the League* (1684); *The History of the Holy War* (1686); and *An Historical Treatise of the Foundation and Prerogatives of the Church of Rome and of Her Bishops* (1685). Several of his books are upon the Papal Index. Consult Reusch, *Der Index der verbotenen Bücher,* vol. ii. (Bonn, 1883-85).

MAIMENE, mī′me-nä′, or **MAIMANA.** A town in Northern Afghanistan (Map: Afghanistan, J 3), about 180 miles northeast of Herat. Previous to 1874 it was the capital of an independent khanate of the same name, and an important commercial centre, with a population estimated at 60,000. In that year, however, the city was captured and a large part of its inhabitants massacred after a siege of six months by the Afghans, who annexed the khanate to their territory. The town has now dwindled to a village of about 2500 inhabitants.

MAIMING (from *maim*, from OF. *mehaigner, mahaigner*, to maim, doublet of *mayhem;* possibly connected with Bret. *machaña*, to mutilate, or with OHG. *mangōn, mangalōn*, Ger. *mangeln*, to lack, Eng. *mangle*). A modern statutory offense, generally consisting in the infliction of a permanent physical injury to man or beast. In England the term is employed in the sense of mayhem (q.v.) when applied to injuries to human beings; but when applied to malicious damage to cattle or other animals (see Malicious Damage Act, Neb. 1861, 24 and 25 Vict., c. 97, §§ 40, 41) it is used in the popular sense of mutilating. It bears this broader signification in most statutes in this country. The offense is generally declared to be a felony when committed against human beings or cattle, and a misdemeanor when against other animals than cattle. Maiming one's self to escape the performance of some legal duty, or in order to excite sympathy and obtain alms, is punishable under many modern statutes. Consult: Bishop, *Commentaries on the Law of Statutory Crimes* (Chicago, 1901); Archbold's *Pleading, Evidence, and Practice in Criminal Cases* (London, 1900).

MAIMON, mī′môn, Salomon (1754-1800). A Jewish German philosopher, born in Lithuania. Until 1770 he devoted himself to the Talmud, with promise of great ability; then he broke with orthodox Judaism by a critical commentary on the *Moreh Nebochim* of Maimonides. In Berlin, where he went in 1773, he became interested in Wolff's metaphysics, and was well received by Mendelssohn. Maimon's most important work was the eclectic *Versuch einer Transcendentalphilosophie* (1790). His autobiography, edited by Moritz in 1792, was translated into English by Murray (1888).

MAIMONIDES, mī-mŏn′ĭ-dēz, properly Moses ben Maimon ben Joseph, Arabic Abu Amram Musa ibn Maimun Obeid Allah al-Kortobi (1135-1204). A great Jewish scholar and philosopher. He was born at Cordova, March 30, 1135. Little is known of his early life. He received his first instruction from his father, himself a learned man, and later devoted himself to the study of Greek (Aristotelian) philosophy, the science of medicine, and theology, under the most distinguished Arabic masters of the time. When Abd al-Mumin, the Almohade ruler, captured Cordova in 1148 (see Almohades), all Jews and Christians residing there were forced to embrace Islam or emigrate. Maimonides's family outwardly adopted the Mohammedan faith, or rather renounced the public profession of Judaism, but after a time, finding no sign of a change, resolved to emigrate. In 1159 they were at Fez, in 1165 at Acre, and thence by way of Jerusalem they proceeded to Cairo, where the father died. Maimonides's great knowledge of medicine soon gained him the position of physician to Saladin, the Sultan of Egypt, and by virtue of his rabbinic learning in 1177 he became Rabbi of Cairo. He died December 13, 1204. His body was carried to Tiberias and in course of time his tomb became a place of pilgrimage. Maimonides's importance for the religion and science of Judaism and his influence upon their development gained for him the title of a 'second Moses.' His activity extended over the range of Jewish studies—theology, exegesis, and philosophy. Imbued with the spirit of Greek speculation, and acquainted with the best of Arabic thought, he endeavored to explain the Bible by the light of reason, and was the founder of a rational exegesis. When literal interpretation seemed to jar upon the feeling of reverential awe due to the Most High, he did not hesitate to substitute an allegorical interpretation. The most striking feature of his philosophical system is the close similarity to that of Averroës. It is a grand attempt to reconcile rabbinic Judaism with the prevailing Aristotelian system of thought, as modified by Arabic philosophers. He differs from Aristotle, however, in maintaining that creation by the divine will proceeded from nothing (*creatio ex nihilo*). He held to the freedom of the will, and condemned a life of asceticism, or dreamy albeit pious contemplation. He taught that the body as well as the soul should be developed and cared for, and hence the study of natural science and medicine is a matter of prime necessity. The soul, and the soul alone, is immortal, and the reward of virtue consists in its—strictly unbodily—bliss in a world to come; the punishment of vice is the 'loss of the soul.' Maimonides's first important work was an Arabic commentary on the Mishna, called by him *Siray* ('Illumination') and finished in 1168. It was translated into Hebrew, and for more than five centuries has been deemed so essential a part of the Talmud itself that no edition of the latter is considered complete without it. This was followed by the 'Book of Precepts,' in Arabic, which is to be considered as an introduction to the gigantic work which followed in 1180, in Hebrew, under the title *Mishne Thora* ('Second Law'; also called *Yad ha-Khazaka*, 'the Strong Hand'). It is a minute and systematic presentation of the Jewish law as developed by the Talmud, and to it he devoted ten years of his life. The summit of his renown Maimonides attained in his Arabic *Dalalat al-Hâirin* (Hebrew *More Nebukhim*, 'Guide of the Perplexed'), a philosophical and rationalistic work on exegesis, finished c.1190, which led to a long and bitter contest between the orthodox and liberal in Judaism. His attempt to systematize the Talmudic precept also aroused opposition; and one result of it, unforeseen by himself, was to increase the punctiliousness in carrying out ceremonial observances. It was felt also that there was a lack of consistency between Maimonides the philosopher and Maimonides the theologian, and it is indeed difficult to reconcile his rationalistic exegesis and his untrammeled philosophical speculation with his attitude toward the minute ceremonies of rabbinic Judaism. Maimonides's minor works include medical, mathematical, logical, and other treatises, legal decisions, theological disquisitions, etc. As early as the thirteenth century portions of his books in Latin translation were in use in European universities, and the *Guide of the Perplexed* was followed to a certain extent by Albertus Magnus and Thomas Aquinas. There is an English translation of the *Guide of the Perplexed* by Friedländer (3 vols., London, 1885). The Arabic of the original with French translation was published by Munk (Paris, 1856-66). Consult: Wünsche and Winter, *Die jüdische Litteratur*, vol. ii. (Trier, 1894); Karpeles, *Geschichte der jüdischen Litteratur* (Berlin, 1886); Grätz, *History of the Jews*, vol. iii. (Eng. trans., Philadelphia, 1873); Guttmann, *Das Verhältniss des Thomas von Aquino zum Judentum* (Göttingen, 1891); Bacher, *Bibelexegese Moses Maimunis* (Strassburg, 1897); Joel, *Die Religionsphilosophie des Mose ben Maimun* (Breslau, 1859); Kaufmann, *Geschichte der Attributenlehre* (Gotha, 1877); Yellin and Abrahams, *Maimonides* (Philadelphia, 1903, with bibliography, pp. 219-233).

MAIN, mīn. A river of Germany and the largest right affluent of the Rhine. It rises in two headstreams in the Fichtelgebirge in Northeastern Bavaria, and flows in a westerly direction through the northern part of Bavaria, and then on the borders of Hesse and the Prussian Province of Hesse-Nassau, joining the Rhine at Mainz (Map: Germany, C 4). The entire length of the Main is 307 miles, and it is navigable from its confluence with the Regnitz, a distance of about 205 miles. The principal towns on its banks are Würzburg and Frankfort. The Main, in spite of its length, is not very important from a commercial point of view, owing to frequently occurring shoals and the tortuousness of its course. It has, however, been canalized between Mainz and Frankfort, so as to admit vessels of 1000 tons, and its waters communicate with those of the Danube by means of the Ludwigs-Kanal.

MAINE, mân. One of the ancient provinces of France, bounded on the north by Normandy, on the east by Orléannais, on the west by Brittany, and on the south by Anjou and Touraine. It corresponds to the modern departments of Sarthe and Mayenne. The Crown obtained final possession of it in 1481, after the House of Anjou had become extinct. The capital was Le Mans.

MAINE (called 'The Province or Countie of Mayne' in the charter granted by Charles I. in 1639, because regarded as part of 'the Mayne land of New England'). A North Atlantic State of the United States, belonging to the New England group. It is the most northeasterly State of the Union, and lies between latitudes 43° 4′ and 47° 28′ N., and between longitudes 66° 57′ and 71° 7′ W. It is bounded on the northwest by the Canadian Province of Quebec, on the northeast by the Province of New Brunswick, on the southeast by the Atlantic Ocean, and on the west by the State of New Hampshire. Its extreme length is a little over 300 miles, its extreme width 185 miles, and its total area 33,040 square miles, the land amounting to 29,895 square miles. Maine is nearly as large as all the rest of the New England States combined, and thirty-fifth in size among the States of the Union.

Topography. The surface of the State is in general moderately hilly, becoming mountainous in the west and north. The elevation rises from the coast northward and from east to west toward the interior. Along the coast in the southwest corner the surface falls into low, flat, and even marshy land, and the country maintains its low and generally level character as far as the Kennebec River. East of the Kennebec the coast region rises to abrupt and bold elevations of 1000 to 1500 feet. The general slope of the State is determined by the main plateau which crosses it in a northeasterly direction and is the continuation of the Appalachians. This system appears here only in somewhat isolated heights which, while preserving the continuity of the Appalachians, can scarcely be called a mountain range. The height of this divide varies from 2000 feet above sea level on the west, where it enters the State, to 600 feet at its eastern extremity, where it dies away in the Aroostook region on the border of New Brunswick. The most prominent peak is Mount Katahdin, 5200 feet high. Nearer the western border stand Mount Abraham, 3388 feet, and Mount Bigelow, 3600 feet.

The fringe-like coast, with its tasseled edge of bold promontories and rocky islands, has given rise to the appropriate appellation of 'hundred harbored Maine.' The fiord-like harbors are the result of the drowning of the river valleys scored out by glacial action, and extending seaward far beyond the present shore line. This has provided Maine with excellent natural harbors, perfectly protected by the islands, but suffering from a serious disadvantage in the great rise and fall of the tides and the resulting swift currents. At Portland the tide rises 11 feet, increasing northward. Yet in spite of this disadvantage the coast between Portland and Eastport contains proportionately the greatest number of good harbors to be found anywhere along the coast of the United States.

There are upward of 600 lakes and ponds, aggregating a total area of over 2300 square miles, or one-fourteenth the total area of the State. They lie for the most part in the elevated plateau region, and are of great natural beauty. The most noted are: Moosehead Lake, 120 square miles in extent, the largest inland body of water in New England, and the source of the Kennebec River; the Rangeley Lakes, with an area of 90 square miles, the headwaters of the Androscoggin River; Chamberlin Lake, supplying the Saint John; and Chesuncook Lake, connected with the Penobscot River.

The largest rivers of Maine are naturally those of the southern slope. The chief of these are the Saco, Androscoggin, Kennebec, Penobscot, and Saint Croix, the last named on the eastern boundary. They are of little value for commerce, being navigable only a few miles inland—the Kennebec 26 miles to Augusta; the Penobscot 27 miles to Bangor. They rise at high elevations, and their precipitous character offers the explanation of their value as sources of water power. The power available for industrial purposes is enormous, the Adroscoggin alone having developed over 70,000 horse-power. Besides, the lakes in connection with these rivers furnish reservoirs for the storage of water, and thus make possible a uniform and constant supply of power through all the year. It is estimated that about 2,000,000 horse-power is available. This is utilized especially at the falls which characterize most of the rivers, and which are due to the unyielding granite beds that cross their path. The Saint John River traverses the northwest corner of the State, and forms part of the boundary with New Brunswick.

Climate. Maine lies in the heart of the temperate zone, yet in climate it ranks as boreal in the northwestern part, and the southeastern part is only a region of transition into the austral zone—a region of overlapping floras and faunas. The winter is very severe, except in a narrow strip along the coast. The summers are never hot. The mean temperature for January is 20° F. and 10° in the north. In July the mean temperature is 65° F. in the north and 70° in the south. There is a wide range of temperatures through the year, the average maximum shade temperature of 90° F. occurring all along the coast to Eastport. The anticyclones and north winds of winter bring an average minimum of 20° F. below zero to Eastport and Augusta, while the vicinity of Mount Katahdin records an average minimum of 30° below zero. The weather is subject to sudden falls in temperature in short periods because of the frequent passage of cyclonic and anticyclonic centres and the subjection of the State to alternate oceanic and continental influences. The southern counties have a growing season of less than six months, and the northern counties of only about five months. The average annual rainfall for the whole State is 40 inches, very evenly distributed throughout the year, though there is a maximum precipitation in the late summer and autumn. There is an average annual snowfall at the coast of 60 inches, increasing rapidly to the north and west to over 110 inches. The relative humidity for the whole State is above 70 per cent., though the absolute humidity is rather low, on account of low temperatures. The normal wind direction for January is northwest, and for July is southwest. The State lies in the zone of maximum cyclonic frequency. The cool summers, the lakes, the forests and the rocky seaside attract multitudes of summer tourists, and the coast and lakes are lined with summer cottages. Some of the resorts, notably Bar Harbor, on the eastern end of Mount Desert (q.v.), are among the most popular of the American summer resorts.

For Flora and Fauna, see these paragraphs under United States.

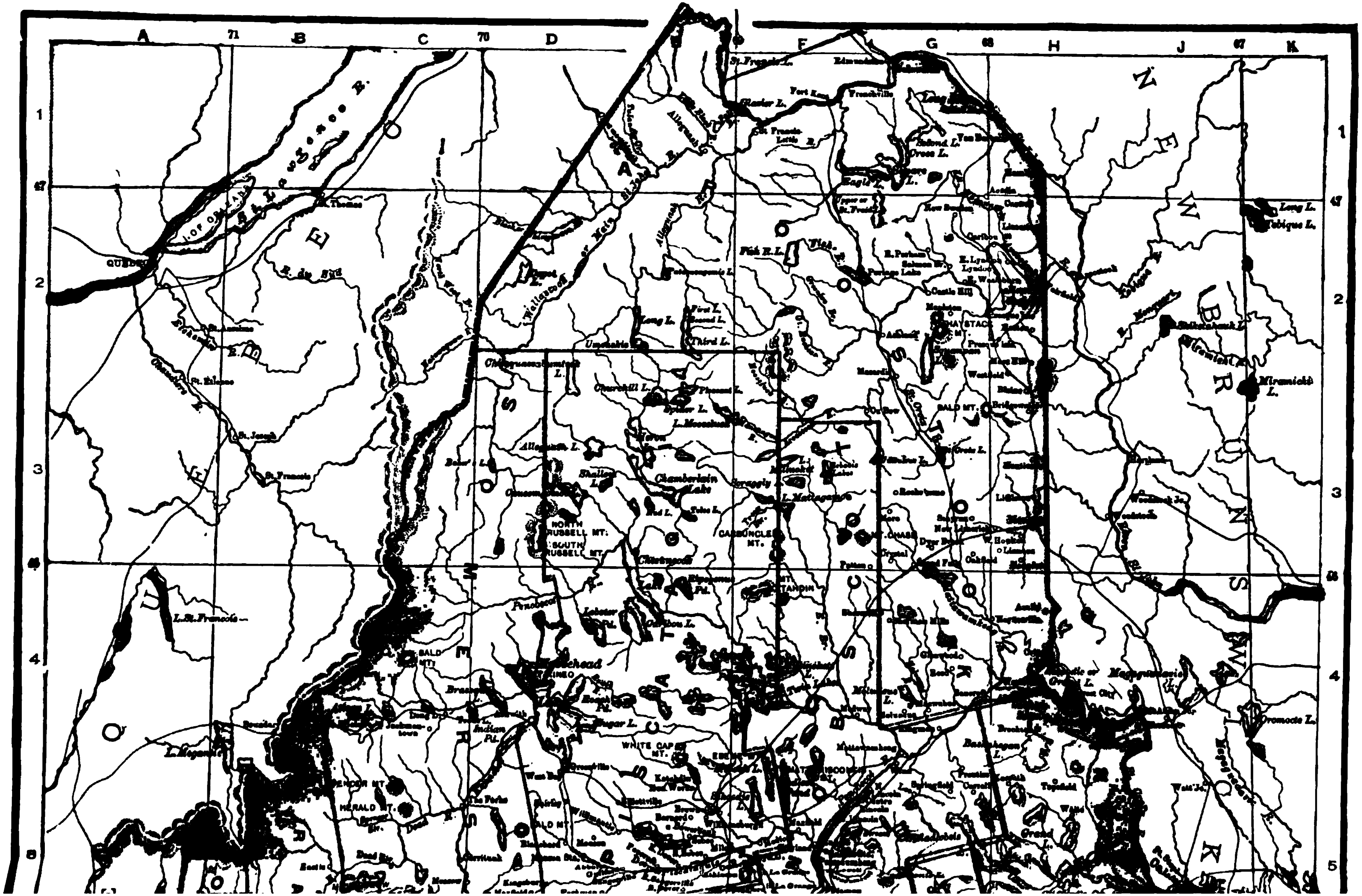
Geology and Soils. Maine has had a very complex geological history. In pre-Cambrian time the State was crossed by two great mountain ranges. One extended along the northwestern boundary through the White Mountains to Long Island Sound east of the Connecticut River; the other extended northeast, along the coast. These mountains were much folded, largely gneissic and schistose, and they were worn down to base level in later Paleozoic time. Through the centre of the State, between these two ranges, a long gulf extended from Gaspé Peninsula to the southwest. By the end of Devonian time this trough was filled with sediments from the aging mountains, only to be uplifted, crumpled, and somewhat metamorphosed, again worn to base level and depressed, allowing carboniferous deposits to be laid down unconformably upon all the older beds. It was uplifted and again worn to base level in Cretaceous time, since which the region has been broadly lifted into a plateau of low elevation and again dissected. The Pleistocene ice sheet covered the State entirely, discharging its marginal ice into the sea. The effect of glaciation was to denude the higher lands, accentuate the river valleys, create many lake basins, and leave the surface strewn with a coating of till. Since Pleistocene time there has been a considerable subsidence, resulting in the submergence of the coastal lowlands, and converting the higher hills and ridges into a fringe of islands, and the drowned valleys into fiords. The latest crustal movement has been a very slight uplift along the coast, uncovering small plains of marine clays which interlock with the rocky headlands. This same slight uplift has revived the rivers, furnishing very valuable water power at the bay heads.

The soils of Maine, with the exception of the Pleistocene marine clays along the coast, are almost wholly glacial. Along some of the rivers and lakes and in many old lake bottoms, long since filled up or drained out, there are alluvial plains of great fertility. The higher outcrops of the crystalline old land are largely denuded of all soil, while the whole surface of the State is more or less strewn with glacial débris. The drift is in places arable, though in wide areas it is unsuited for agriculture. The character of the soil and the large supply and even distribution of rainfall have been determining factors in making the State a rich forest region.

Mineral Resources and Mining. The fact that the surface is largely made up of the bases of worn-down old mountains explains at once the nature of the mineral resources of Maine. Granite rock outcrops all along the coast and for many miles inland. The fiords are incised in it, making it possible often to load the blocks on to the boats direct from the quarry. This fact of convenience and cheap transportation is a large factor, explaining the rank of Maine as second of all the States in granite production, the output in 1889 being valued at $1,321,182. The granite occurs in great veins or in eruptive masses. Some of these were cooled very slowly, evidently at great depth, the crystalline structure being so extremely coarse that the quartz and feldspar constituents can be separated easily and marketed pure. Maine is one of the leading sources of feldspar and silica, used in the manufacture of earthenware, porcelain, glass, flour and wall tile, woodfiller, sandpaper, and scouring soap. The output of silica in 1899 was valued at $50,336, the supply occurring as vein quartz in the crystalline rocks. Along the coast in occasional places and in Aroostook County and other places in the interior, are found beds of crystalline limestone, often a fine quality of marble. The value of the limestones, including the marble, was in 1899 $1,028,375, giving the State the sixth place in the production of this commodity. In the central part of the State valuable slate quarries are worked for roofing, tables, and blackboards; the output in 1899, valued at $181,766, ranked the State fourth in this resource. The total value of quarry products in 1899 was $2,531,223. The crystalline rocks of Maine produce many rare minerals, one of which, tourmalin, is obtained in Oxford County in larger and more beautiful crystals than anywhere else in the world. Copper, silver, gold, iron, tin, and manganese occur in small amounts, the iron and manganese being used only in local smelters. The State reported 26 mineral springs in 1899 as of commercial importance, 10 of these being in Androscoggin County. In this year 1,850,132 gallons were

AREA AND POPULATION OF MAINE BY COUNTIES.

County.	Map Index.	County Seat.	Area in square miles.	Population.	
				1890.	1900.
Androscoggin	C 7	Auburn	480	48,968	54,242
Aroostook	F 2	Houlton	6,408	49,589	60,744
Cumberland	C 8	Portland	1,014	90,949	100,689
Franklin	B 5	Farmington	1,764	17,053	18,444
Hancock	G 6	Ellsworth	1,390	37,312	37,241
Kennebec	D 6	Augusta	880	57,012	59,117
Knox	E 7	Rockland	327	31,473	30.406
Lincoln	D 7	Wiscasset	520	21,996	19.669
Oxford	B 5	Paris	1,981	30,586	32,238
Penobscot	F 5	Bangor	3,254	72,865	76,246
Piscataquis	E 5	Dover	3,626	16,134	16,949
Sagadahoc	D 7	Bath	259	19,452	20,330
Somerset	D 3	Skowhegan	3,881	32,627	33,849
Waldo	E 6	Belfast	748	27,759	24,185
Washington	H 6	Machias	2,456	44,482	45,232
York	B 8	Alfred	957	62,829	64,885


NEW BRUNSWICK
QUEBEC
Quebec
St. Lawrence R.
I. of Orleans
St. Thomas
R. du Sud
St. Joseph
St. Francois
L. St. Francois
L. Megantic
St. Francis L.
Edmundston
Fort Kent
Frenchville
Glazier L.
Allagash
Eagle L.
Long L.
Cross L.
Square L.
Fish R. L.
Portage Lake
Presque Isle
Caribou
Fort Fairfield
Houlton
Castle Hill
Mapleton
Haystack
Ashland
Masardis
Bald Mt.
Umsaskis
First L.
Second L.
Third L.
Churchill L.
Spider L.
Allagash L.
Chamberlain Lake
Telos L.
Mud L.
Chesuncook
North Russell Mt.
South Russell Mt.
Carbuncle Mt.
Katahdin
Millinocket
Matagamon
Patten
Sherman
Mattawamkeag
Moosehead
Kineo
Indian Pt.
White Cap Mt.
Bigelow Mt.
Kingfield
Chiputneticook or Grand L.
Miramichi L.
Tobique L.
Woodstock
Oromocto L.
Grand L.
Lobster L.
Seboomook L.
Penobscot
Brassua L.
Sugar L.
Dead R.
The Forks
Long L.
Bald Mt.
Grand Falls
Mattawamkeag R.
Baskahegan L.
Topsfield
Danforth
Lincoln
A
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C
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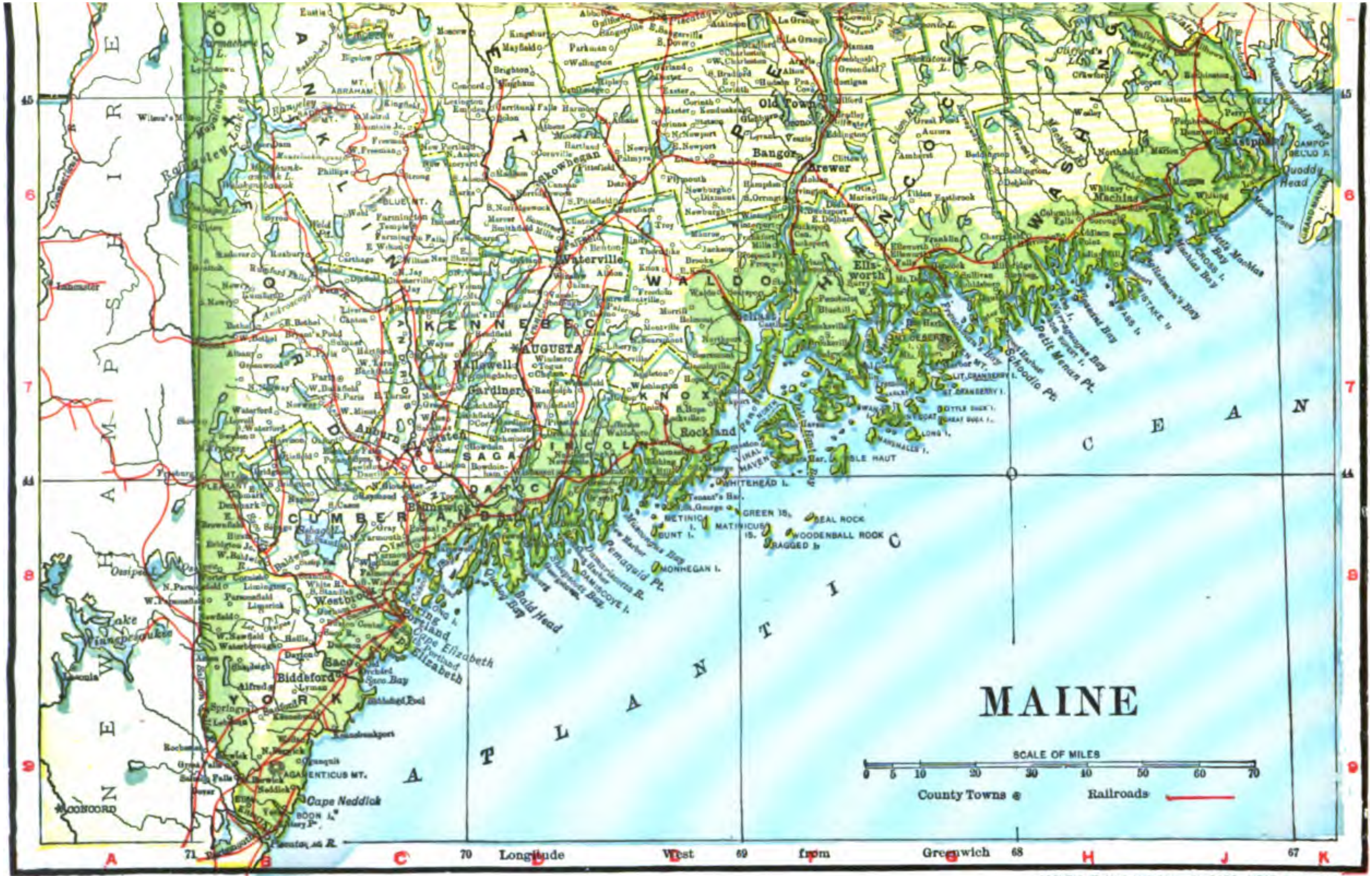

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marketed with a value of $179,450. Potable waters of the highest quality are found in great abundance everywhere, the glacial drift being the usual source of supply for domestic use.

Forests. Maine is one of the leading States in the Union in the extent of wooded area and in the annual value received from the forest products. The woodland is estimated at 23,700 square miles, or 79 per cent. of the total land area. The forests cover largely the interior and northern portions of the State, the coast and lower valleys being generally cleared. The land rapidly reforests, and since most of the land is not well suited to cultivation, reforestation is extensive. Large areas at one time under cultivation have been allowed to go back to woodland. The primeval forests of pine are all gone, and the second growth is being used to some extent. The spruce forests are the most extensive and most heavily drawn upon at present. Authorities estimated in 1896 that the State had 21,239,000,000 feet of standing spruce. Of this nearly a third was in the region drained by the Saint John River, and nearly a fourth in the region drained by the Penobscot. The densest spruce forests—the largest, finest trees—are found in the upper basin of the Androscoggin River. The basin of this river has contributed about 44 per cent. of the supply used in the manufacture of pulp and paper. The Kennebec and Penobscot basins have contributed the remainder. The table on the following page shows that the paper and wood pulp industry is largely a development of the last decade of the nineteenth century. The pulp mills are located along the three rivers above mentioned. A belt of white birch timber extends entirely across the State, and this species figures prominently in the lumber industry. From it spools to the value of a million dollars are manufactured annually. Spool timber is shipped extensively to Scotland. Poplar is cut most extensively in the Kennebec region, where it is used in paper manufacture. In the Saint John and Penobscot basins there are extensive forests of cedar. Much has been done in the way of constructing dams, canals, and sluices to facilitate the transportation of logs.

Fisheries. Maine ranks second among the New England States in the value of its fisheries and first in the number of men engaged in the fishing industry. In 1898 the total number of persons so employed was 16,954, of whom 8237 were shoresmen and 6770 were employed in shore or boat fisheries. The total value of the product for the same year was $2,654,919, of which $992,855 represented the lobster fisheries, this being more important in Maine than in all the other New England States combined. Clam fishing ranks next, being also more important than in any other New England State. The salmon fishery on the Penobscot River, though small, is the largest on the Atlantic Coast. The canning industry is very prominent in connection with the shore fisheries, particularly the preparation of small herring as sardines. Clams also figure prominently in the canning products. The State law of 1895 resulted in the discontinuance of lobster-canning, which was formerly very important. The preparation of smoked herring is of considerable moment.

Agriculture and Live Stock. Like that of the other New England States, the surface is too rugged and broken, also the soil for the most part too sterile, to admit of the extensive development of agriculture. In the river valleys, however, the soil is very fertile. The Aroostook Valley, in the northeastern part of Maine, is the largest district of fertile farming land in New England. Only 32.9 per cent. of the total land area is included in the farms, and of this acreage only 37.9 per cent. is improved. But these areas increased steadily until 1880. Since then both have decreased—the latter very considerably. During the period from 1850 to 1900 the average acreage per farm remained nearly constant, the average for the latter year—106.2 acres—being the largest for the entire period. The average size of the farms varies greatly in the different counties. The State is remarkable for the small percentage of rented farms—less than 5 per cent. of the total.

As elsewhere in New England, the influence of the Western competition has obliged the Maine farmers to give up cereal farming in part, especially wheat. Oats is now the principal cereal, although this too decreased in the last two decades of the century. Buckwheat, the next most important cereal, has more than held its own, but corn and wheat decreased from 1880 to 1900. The area devoted to cereals is rapidly increasing in Aroostook County, constituting in 1900 one-half of the total for the State. The potato crop, though having a less acreage than oats, produces a greater income than all the cereal crops combined. In Aroostook County an average of 6.6 acres per farm is devoted to potatoes. Intensive methods of cultivation are used, and a very high per acre product is obtained for potatoes, as also for most other crops. The acreage of hay and forage is over seven times as great as that of the cereals. Increased attention is being given to dairying and market gardening, the poorer soils being turned into permanent pastures and the most fertile being appropriated for the raising of market products. Sweet corn is the most important of these crops. Much attention is given to the raising of apples, the total number of trees in 1900 exceeding 4,100,000—an increase of 39.3 per cent. for the decade ending in that year. Other orchard and small fruits receive little attention.

Stock-raising is not a leading industry. Since 1880 the number of sheep has decreased over one-half, and the number of neat cattle had decreased rapidly after 1860 until the last decade of the century. The number of horses more than doubled during the last half of the century. Likewise the growing interest in dairying has resulted in the number of milch cows increasing considerably during the same period. In 1900, 29.9 per cent. of the farms of the State derived their principal income from dairy produce. The production of milk increased 71.8 per cent. during the decade ending in that year. Over $5,600,000 was realized from the sale of dairy products, about two-fifths being the returns for milk, two-fifths for butter, and one-fifth for cream.

The following tables show the importance of the leading kinds of crops and farm animals for the census years 1890 and 1900:

	1900	1890
Hay and forage, acres	1,270,254	1,300,302
Oats, acres	108,661	121,612
Buckwheat, acres	25,292	22,395
Corn, acres	16,856	10,891
Barley, acres	8,809	11,972
Potatoes, acres	71,765	

	1900	1890
Dairy cows	173,592	157,278
Other cattle	165,255	141,832
Horses	106,299	109,156
Mules and asses	401	278
Sheep	252,213	370,484
Swine	79,018	91,297

Manufactures. Manufacturing is of much importance, 74,800 wage-earners, or 10.8 per cent. of the population, being engaged in this line in 1900. The percentage of the population thus occupied has increased continuously in the last half century. It was only 4.8 in 1850. The total value of the product in 1900 was $127,361,000. The development of the manufacturing industry is due to the extensive water power afforded by the numerous rivers of the State and also to the excellent commercial advantages offered by the harbors, and, in later years, by the railways. The factories are located, almost without exception, along the rivers or on the coast, and most of them are run by water power. The manufacture of textiles—cotton and woolen goods—leads in importance. Both cotton and woolen mills were in operation during the early years of the nineteenth century. The cotton mills of to-day are all west of the Kennebec River. Lewiston is the chief centre. The woolen mills are more widely distributed, but also derive their power from the streams. The manufactures of cotton show a slight decrease in value during the decade 1890-1900. This is probably due in part to the increasing competition of the Southern States.

Shipbuilding formerly depended upon the forests for its supplies, but with the increased use of steel in vessel construction, the shipbuilding industry of Maine has declined. The industry is one of the oldest in the State, a vessel having been built as early as 1608. For a long time Maine held first rank in the industry, and indeed constructed more than half of all the sea-going vessels of the nation. At Bath, the principal shipbuilding centre, the construction of steel vessels has attained considerable importance. The leather industry also dates from an early period. It was one of the State's leading industries between the years 1861 and 1870. The bark of the hemlock was used in tanning, and the industry is declining as the supply of this bark becomes scarcer. Other noteworthy industries are represented by the foundries and machine shops and printing and publishing houses. The following table gives a comparison of the chief industries for the years indicated:

INDUSTRIES	Year	Number of establishments	Wage-earners—average number	Value of products, including custom work and repairing
Total for selected industries for State	1900	1,689	43,730	$73,368,312
	1890	1,580	39,651	54,631,124
Increase, 1890 to 1900	......	109	4 079	$18,737,188
Per cent. of increase	......	6.9	10.3	34.3
Per cent. of total of all industries in State	1900	25.2	58.5	57.6
	1890	31.5	56.3	57.1
Cotton goods	1900	15	13,723	$14,631,086
	1890	23	13,912	15,316,909
Fish, canning and preserving	1900	117	5,567	4,779,733
	1890	35	2,342	1,660,881
Flouring and grist-mill products	1900	227	192	3,399,832
	1890	210	262	3,254,690
Foundry and machine-shop products	1900	112	2,143	3,298,706
	1890	82	1,768	2,628,572
Leather, tanned, curried, and finished	1900	31	587	2,451,713
	1890	51	852	3,363,672
Lumber and timber products	1900	838	6,834	13,489,401
	1890	894	11,540	11,849,654
Paper and wood pulp	1900	35	4,851	13,223,275
	1890	17	1,509	3,281,051
Printing and publishing, newspapers and periodicals	1900	120	1,309	2,190,017
	1890	105	949	1,719,477
Ship and boat building, wooden	1900	115	1,369	2,491,765
	1890	85	1,450	2,818,565
Wool manufactures	1900	79	7,155	13,412,784
	1890	78	5,067	8,737,653

Transportation and Commerce. Maine is the only one of the New England States in which there was a large railroad construction in the last decade of the nineteenth century. This mileage increased from 1377 miles in 1890 to 1928 in 1900. Prior to this decade railway construction had been confined mainly to the central and southwestern parts of the State. During that decade the Bangor and Aroostook line was built into the northeast counties, and its influence was largely responsible for the rapid development of the forest and farming industries which has taken place in that section. The Canadian Pacific crosses the State from east to west. The construction of electric railways, including interurban lines, is increasing rapidly. The electric railway mileage in 1901 aggregated 286 miles. Among the many fine harbors, that of Portland (Casco Bay), especially, is easy of access, deep, large, and well protected, and is often unobstructed by ice when harbors farther west and south are frozen over. Lines of steamers ply regularly between the largest cities of the State and Boston; also between Portland and New York, Saint John, N. B., and Halifax.

For the year ending June 30, 1901, the exports from the Portland and Falmouth customs district amounted to $12,403,958 and the imports to $633,114. The chief imports are coal, fish, sugar, iron, molasses, and wool; the chief exports are cotton goods, canned vegetables, boots, shoes, lumber, bacon, hams, etc.

Banks. In 1902 there were 86 national banks with loans aggregating $27,857,000; cash, etc., $2,027,000; capital, $10,531,000; and deposits, $26,263,000. In 1901 there was $69,533,058 deposited in savings banks, the total number of depositors being 196,583.

Finance. Receipts of the State Treasury for the two years ending December 31, 1900, were $3,953,647; disbursements, $3,754,768; balance on hand, December 31, 1900, $198,879. The principal sources of State revenue during 1890 and 1900 were: From cities, towns, etc., $1,815,902; savings banks, $851,566; railroads, $323,052; insurance companies, $131,405; new corporations, $71,565. The total revenue for the State during the two years was $1,783,021. The bonded debt at the close of 1900 was $2,103,000, a reduction of $516,300 since 1890. Outstanding temporary loans against the State aggregated $350,000.

Government. The present Constitution was adopted by the people in town meetings, in December, 1819. To secure an amendment a two-thirds vote of both Houses and a majority vote of the people at their next biennial meeting are necessary. A three months' residence in the State and the ability to read English are required of voters. The suffrage is withheld from paupers, Indians not taxed, and persons under guardianship. Soldiers from the State may vote when serving outside the State.

Legislature. The Legislature, composed of a Senate of 31 members and a House of Representatives of 151 members, elected on the second Monday of September, biennially, meets on the first Wednesday in January. The Representatives are elected from the towns, the Senators from districts bounded by county lines. The Governor's veto is overcome by a two-thirds vote of each House. Revenue bills originate in the Lower House. The power of impeachment rests with the House, the trial of impeachments with the Senate. The State has four representatives in the Lower House of Congress.

Executive. The Governor is elected biennially (a plurality being necessary to election). He has the advice of a council of seven members elected biennially by the Legislature on joint ballot, but only one councilor can be elected from any district prescribed for the election of Senators. The Governor and Council have power to remit penalties and grant reprieves, pardons, and commutations. The president of the Senate and Speaker of the House are respectively in the line of succession to the Governorship in case of vacancy in that office. A Secretary of State and a Treasurer are elected biennially on joint ballot.

Judiciary. The Supreme Court, composed of eight judges, is appointed by the Governor and Council for a term of seven years. The County of Cumberland, embracing the city of Portland, has a Superior Court of one judge appointed in the same way. Probate judges are elected by the people of each county for terms of four years. Judges of inferior courts are appointed by the Governor and Council for terms of seven years. Judges of municipal and police courts are similarly appointed, and hold for four years. An Attorney-General is chosen biennially on joint ballot.

Local Government. A sheriff is elected biennially in each county. The indebtedness of a municipality is limited to 5 per cent. of its valuation.

Other Constitutional or Statutory Provisions. In 1846 Maine passed the first prohibitory liquor law, and in 1884 inserted a prohibition clause in the Constitution. The laws against the manufacture of and the traffic in intoxicating liquors are very strict and supported by severe penalties. Liquors for medicinal, mechanical, and manufacturing purposes are sold in towns and cities under the supervision of State agents. Husbands are not liable for debts contracted by their wives in their own name, but the latter may be sued for them. A wife may hold real and personal estate separately from her husband, and may convey or devise the same by will. The legal rate of interest is 6 per cent., and any rate is allowed on contract.

Militia. In 1900 there were 142,175 males of militia age. In the State militia force there were 93 commissioned officers and 1165 enlisted men.

Population. The following figures indicate the growth of the population: 1790, 96,540; 1810, 228,705; 1830, 399,455; 1850, 583,169; 1860, 628,279; 1870, 626,915; 1880, 648,936; 1890, 661,086; 1900, 694,466. In 1900 Maine ranked in respect to population thirtieth among the States of the Union. The West has drawn heavily upon the population here. The increase in the last decade amounted to 5 per cent., as compared with 20.7 for the United States. The largest increase for the decade, as also for the last half of the century, was in Aroostook County. The foreign population in 1900—mostly Canadian—numbered 93,330. The French element is prominent in the southwestern counties. In 1900 there was an average of 23.2 inhabitants to the square mile. In the same year twenty-five cities had each a population exceeding 4000, and together constituted 36.2 per cent. of the total population.

Cities. The following figures give the population for the largest towns in 1900: Portland, 50,145; Lewiston, 23,761; Bangor, 21,850; Biddeford, 16,145. Augusta is the capital.

Religion. The immigration into the State during recent years, including the large number of French Canadians, has increased the Catholic population until the Catholic communicants number over one-third of the total Church membership. The strongest Protestant denominations in their order are the Baptists, Methodists, and Congregationalists.

Education. In the year 1900, 5.1 per cent. of the population ten years of age and over was illiterate. For the native white population alone it was 2.4 per cent. As in the other New England States, much attention was given here to education from the earliest colonial period. In 1821, soon after the establishment of Statehood, a law was passed requiring every town and plantation to raise and expend not less than forty cents annually per inhabitant for school purposes. A law of 1828 set apart twenty townships of public land for the establishment of a public school fund. This was augmented by certain moneys received from Massachusetts on account of claims against the United States for services in the War of 1812. The district plan of school supervision has been abolished and town management has taken its place. There is a strictly enforced compulsory attendance law which covers the age period from seven to fifteen inclusive. The whole number of scholars in attendance during the school year of 1901 was 132,862, of whom 97,038 were in average daily attendance. In 1901 there were 1349 graded and 2896 ungraded schools. The average length of the school term in 1900 was 141 days. Secondary education was very generally provided for, even before public aid was extended to it, by a large number of private or denominational academies. In 1873 provision was made for State aid to towns which maintained schools for free academic instruction. This proved a death blow to many of the old academies. In many instances the old academy buildings were occupied by the free high school. In 1889 towns were authorized to contract with any academy or high school for the tuition of their scholars, and to receive the same aid from the State as if they had established a free high school within the town. A large number of academies now receive State aid. In 1901 there were 211 free high schools receiving aid from the State, with a total attendance of 13,183. In 1900 the State employed 6445 teachers, of whom 5360 were women. State normal schools are maintained at Farmington, Castine, and Gorham. In 1895 the State authorized the State superintendent to hold three or more summer schools, each of two weeks' duration, for the benefit of teachers. In 1901, 1408 of the State's teachers had graduated from normal schools. The State has charge of the examination and certification of teachers. The total expenditure for schools in 1900 was $1,712,795, of which $1,229,004 was paid as salaries to teachers and superintendents. Higher education is provided for at the State University at Orono, and by the following denominational colleges: Bowdoin (Congregational) at Brunswick, Bates (Free Baptist) at Lewiston, and Colby (Baptist) at Waterville.

CHARITABLE AND PENAL INSTITUTIONS. There are insane hospitals at Augusta and Bangor, an orphan asylum in Bangor, the military and naval orphans' asylum at Bath, and the Maine General Hospital, a school for the deaf, and an eye and ear infirmary, all at Portland. The National Government maintains a soldiers' home at Togus and a marine hospital at Portland. The State prison is at Thomaston, the reform school is near Portland, and the industrial school for girls is at Hallowell. Convicts at the State prison are employed in the manufacture of carriages, harness, furniture, and brooms. At some of the county jails the prisoners make heels and inner soles for boots and shoes. In a few counties the jails are leased, together with the labor of the convicts. Farm labor and certain other lines of work are engaged in at the reform school.

HISTORY. Maine attracted the interest of explorers early in the sixteenth century. Giovanni da Verrazano sailed down the coast in 1524, Estevan Gomez followed him in 1525, and before the middle of the sixteenth century more than one navigator had sailed up the Penobscot River in search of splendid Norumbega (q.v.), with its columns of crystal and silver. In 1580 John Walker, sailing in the employ of Sir Humphrey Gilbert, led an expedition to Maine, but with no results. The voyages of Gosnold (1602), Pring (1603), and Weymouth (1605) were followed by that of John Smith (1614), who left an account of the country in his *Description of New England*. In 1604 a French expedition under De Monts (q.v.) planted upon Neutral Island, in the Saint Croix River, a colony which was abandoned in the following year. Maine fell within the limits of the grant made to the Plymouth Company by James I. in 1606, and in the following year an English expedition sent out by Sir John Popham and Sir Ferdinando Gorges effected a settlement at Sabino Point, at the mouth of the Sagadahoc or Kennebec River. In 1608 the settlement was abandoned and most of the colonists returned to England. French Jesuits landed on Mount Desert as early as 1608, and in 1613 they were joined by a number of fishermen; but Captain Argall (q.v.) broke up the colony within a short time. In 1622 Sir Ferdinando Gorges and Captain John Mason received from the Council for New England a grant of the territory between the Merrimac and the Kennebec rivers extending for sixty miles inland. The proprietors divided their possessions, the former taking the land east of the Piscataqua River. A colony of fishermen settled on Monhegan Island in 1623, but disappeared three years later. The first permanent settlement in Maine was made at Pemaquid in 1625-26: Agamenticum (York) was founded about the same time, and after 1630 Saco, Biddeford, Port Elizabeth, Portland, and Scarborough sprang up in rapid succession. In 1639 Gorges received a large accession of territory and was confirmed in his old possessions with the title of Lord Palatine, and established a provincial government at York. Before this time the Council for New England had issued many patents covering lands already granted to Gorges, and in the disputes that followed Massachusetts was called in as arbitrator. Taking advantage of the civil war that was then raging in England, the Massachusetts Government proceeded to bring Maine under its own authority. In 1652 it annexed all the towns as far east as Casco, basing its right on its charter, which granted it all lands, three miles north of the source of the Merrimac. By 1660 all Maine west of the Penobscot was reduced, and it was retained in spite of royal orders from Charles II. and a grant made in 1664 to the Duke of York of all the territory between Pemaquid and the Saint Croix. In 1677 the claims of the Gorges heirs were bought by Massachusetts, and by the charter of 1691 Massachusetts was confirmed in possession of the territory. East of the Penobscot the French held the land and assiduously stirred up the Indian tribes against the English. In 1675 an outbreak of the Tarentine tribe marked the beginning of a long struggle in which most of the towns on the coast east of the Piscataqua were laid waste. The country suffered greatly, too, in the French and Indian wars. During King William's reign the inhabitants of Cocheco were massacred by the Penacook Indians, Pemaquid was taken, and the settlements east of Falmouth were abandoned. From 1722 to 1725 the tribes of Nova Scotia and eastern Maine waged a fierce warfare against the colonists, and security was not really established till the Treaty of Paris in 1763. During the Revolution Maine was active in the patriot cause. At the end of the war Massachusetts retained possession of the territory, exercising jurisdiction over it as the 'District of Maine.' Disputes with the mother State were frequent, and between 1783 and 1791 steps toward independence were taken. The tendency toward separation was hastened by the fact that the inhabitants of Maine were Democratic in their political sympathies and tolerated with difficulty the rule of Federalist Massachusetts. In the War of 1812 Maine was left ill defended by Massachusetts, and its territory east of the Penobscot was occupied by the British. After the war the separatist movement grew rapidly. Probably, however, the desire for separation from Massachusetts would not have been so quickly realized if the struggle over the admission of Missouri into the Union had not brought about the necessity of admitting a Northern State to preserve the balance of power. On March 15, 1820, Maine became a State. Industry and commerce received a great impetus after the War of 1812, but throughout the nineteenth century the increase in wealth and population was rather steady than swift. The dispute with England concerning the northeastern boundary of the State was the cause of constant quarrels between the inhabitants of Maine and New Brunswick. The officials sent out by both to take possession of the disputed lands on the Saint Croix River came into collision and hostilities were prevented only by the negotiation of the Ashburton Treaty (q.v.) in 1842. The only important subject of legislation in the State of other than local interest has been that of prohibition. After some tentative lawmaking, a stringent prohibitory law, passed in 1858, was incorporated into the Constitution, and has remained in force ever since. Many minor regulations looking toward the effectual execution of the prohibitory law have been passed at frequent intervals, but prohibition on the whole has not turned out entirely successful, and evasions of the law are frequent. Before 1856 Maine was generally Democratic in State elections, and only once (1840) voted against the Democratic candidate in Presidential elections. Since 1856 it has been emphatically Republican except in the years 1878 and 1880, when the Democrats and Greenback Party in fusion succeeded in electing their candidate for Governor. The Governor chosen in 1878 was Alonzo Garcelon. In 1879 an election for members of the Legislature took place, and Governor Garcelon, desirous of gaining the Legislature for the fusion party, seized every opportunity afforded by the irregular but time-honored way in which elections were conducted to refuse certificates to Republican candidates and seat Democrats in their place; a Democratic majority was thus secured, and the Legislature was organized. The Republicans organized a rival body and proceeded to elect a Governor, since no candidate had received a majority at the polls. Peace was preserved by the militia until a decision of the Supreme Court established the legality of the Republican Legislature. In 1891 the Australian ballot law was passed. The Constitution of Maine was adopted on October 29, 1819. and is still in force, having been amended between 1841 and 1881.

The following have been the Governors of the State since its admission into the Union:

William King	Democrat	1820-21
William D. Williamson (acting)	Democrat	1821
Albion K. Parris	Democrat	1822-27
Enoch Lincoln	"	1827-29
Nathan Cutter (acting)	"	1829-30
Jonathan D. Hunton	"	1830-31
Samuel E. Smith	"	1831-34
Robert P. Dunlap	"	1834-38
Edward Kent	Whig	1838-39
John Fairfield	Democrat	1839-40
Edward Kent	Whig	1840-41
John Fairfield	Democrat	1841-43
Edward Kavanagh	"	1843-44
Hugh J. Anderson	"	1844-47
John W. Dana	"	1847-50
John Hubbard	"	1850-53
William G. Crosby	Whig and Free-Soil	1853-55
Anson P. Morrill	Republican	1855-56
Samuel Wells	Democrat	1856-57
Hannibal Hamlin	Republican	1857
Joseph H. Williams (acting)	"	1857-58
Lot M. Morrill	"	1858-60
Israel Washburn	"	1861-63
Abner Coburn	"	1863-64
Samuel Cony	"	1864-67
Joshua L. Chamberlain	"	1867-71
Sidney Perham	"	1871-74
Nelson Dingley	"	1874-76
Selden Connor	"	1876-79
Alonzo Garcelon	Democrat-Greenback	1879-80
Samuel F. Davis	Republican	1880-81
Harris M. Plaisted	Democrat-Greenback	1881-83
Frederick Robie	Republican	1883-87
Joseph R. Bodwell	"	1887
Sebastian S. Marble (acting)	"	1887-89
Edwin C. Burleigh	"	1889-93
Henry B. Cleaves	"	1893-97
Llewellyn Powers	"	1897-1901
John F. Hill	"	1901-—

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MAINE, Sir HENRY JAMES SUMNER (1822-88). An English scholar and jurist. He was born August 15, 1822, and in 1840 he went to Pembroke College, Cambridge. After a brilliant career as student, he was made tutor in Trinity College in 1845, and in 1847 he was appointed regius professor of civil law in the university. He resigned in 1854 to become reader on jurisprudence in the Middle Temple. In 1862, after repeated invitations, he went to India as law member of the supreme Government. This office he filled with high distinction, his extensive knowledge of primitive peoples enabling him to introduce many important legislative reforms. He remained in India until 1869. On his return to England he was elected professor of jurisprudence at Oxford, and the next year he was made a member of the Council of the Secretary of State for India, receiving the dignity of knighthood. In 1877 he was elected master of Trinity Hall, Cambridge, and in 1878 he resigned his Oxford professorship. In 1887 he became professor of international law at Cambridge. His academic duties did not prevent him from residing in London, where he figured as a successful journalist and as a valued member of the Council for India. He published a number of works embodying his research on the origin and development of institutions, the condition of primitive society, and the growth of law and legal conceptions. On these subjects he is one of the highest authorities. The value of his contributions to science was recognized by various foreign societies which elected him to membership. His chief works are: *Roman Law and Legal Education*, published in the *Cambridge Essays* (1856); *Ancient Law* (London, 1861); *Village Communities in the East and West* (London, 1871); *Lectures on the Early History of Institutions* (1875); *Modern Theories of Succession to Property* (1878); *Dissertations on Early Law and Customs;* and *Popular Government* (1885). These works are characterized by keenness of judgment and wide learning. He died in 1888. Consult: Duff, *Sir Henry Maine: A Brief Memoir of His Life* (London, 1892); Pollock, *Oxford Lectures* (Oxford, 1890).

MAINE, UNIVERSITY OF. A co-educational State institution at Orono, Maine, founded on the national land grant in 1865 under the name of the State College of Agriculture and Mechanic Arts. The present name was assumed in 1897. The university comprises the colleges of arts and sciences, agriculture, engineering, and pharmacy, and the school of law. The Maine Agricultural Experiment Station is a department of the university. The university confers the bachelor's and master's degrees in arts, philosophy, science, and law, the degrees of civil, mechanical, and electrical engineer, and pharmaceutical chemist. Military instruction is required by law. Students are admitted upon examination or on a certificate from an accredited school. The total attendance in 1902 was 484, and the faculty numbered 58. The library contained about 22,000 volumes. The endowment was $218,300; the value of grounds and buildings, $247,241; and of all the college property, $322,241. The income was $105,680, of which $15,000 is received from the Federal Government for the experiment station, $25,000 for the maintenance of the university, and $20,000 is provided by the State for current expenses. During 1902 courses were begun in mining and naval engineering, a summer school and a correspondence course were established, and uniform entrance requirements with all other Maine colleges were adopted.

MAINE DE BIRAN, mân de bê'räN', FRANÇOIS PIERRE GONTHIER (1766-1824). A French metaphysician. He was born at Bergerac in the Department of Dordogne and was trained by the *frères doctrinaires* of Périgueux. In 1785 he joined the bodyguard of Louis XVI., but retired to his native town on the outbreak of the Revolution. He was elected to the Five Hundred in 1797, became *sous-préfet* of Bergerac in 1806, Count of the Empire in 1809, and in 1812 made his permanent home in Paris. He changed from Napoleon to the Bourbons, sat in the loyal chamber of 1816, and remained an ardent royalist till his death, July 20, 1824. Maine de Biran published very little during his lifetime, and his full importance was appreciated only by those who knew him intimately, men like Royer-Collard and Cousin, the latter of whom speaks of Biran as his teacher. His theories in their entirety remained unknown until Cousin published a part of his works in 1841, and Naville issued his *Life* (1851), and an edition of his important writings (1859). Chief among these are: *Rapports du physique et du moral; Essai sur les fondements de psychologie; Nouveaux essais d'anthropologie.* In the beginning Biran was a sensualist and a follower of Condillac, but found mechanical sensation incapable of explaining the phenomenon of consciousness. He worked out a system of personality in which the ego was made the centre of the universe, original and uncreated itself, creating everything outside itself. This ego Biran identified with living force—will (in this anticipating Schopenhauer). At first will is merely blind, unconscious effort (Schopenhauer's will-to-live); passing through the stages of sensation, or glimmering consciousness and perception, or the consciousness of concrete objects, it attains its highest development in reflection, abstract thought, when the ego formulates mathematical truths and is capable of contemplating itself. Life, then, is will; and the outer world is not material, but merely the impression produced by the clashing of other wills against our own. The world exists only as conditioned by will; God exists because the idea of God is necessarily grounded in the nature of the will. This reasoning influenced Fichte and the German idealists, but failed to retain its hold on Biran himself. If the world, he went on to argue, is the realization of will, does not the unchanging order of the universe presuppose an invincible, infallible will, striving ever at one aim according to immutable laws of its own nature? Such an exalted living force Biran failed to find in the pitiful human will, and he saw himself driven into the assumption of a superhuman will, whose image the universe might be—God. And as formerly everything and God were to him creatures of man's will, now everything, including man, was but the manifestation of the divine will. Biran was well on the way to mysticism when he died. Consult Naville, *Maine de Biran* (3d ed., Paris, 1874).

MAINE-ET-LOIRE, â lwär. A northwestern inland department of France, bounded on the west by the Department of Loire-Inférieure, and on the east by that of Indre-et-Loire (Map: France, F 4). Area, 2749 square miles. The surface is gently undulating, and is traversed by the Loire. The soil is fertile, producing the usual cereal and vegetable crops, and a variety of excellent fruits. The vine is largely cultivated. Stock-raising is carried on. Iron and coal mines are worked; and there are numerous mills and factories for the production of cotton, woolen, and linen goods. Capital, Angers. The department is formed mainly out of the ancient Anjou. Population, in 1896, 514,870; in 1901, 514,658.

MAINE LIQUOR LAW. See MAINE.

MAIN GUARD. The principal guard of a post, camp, or barracks is called the main guard, to distinguish it from purely local or minor guards, as stable guard, park guard, etc. Where regiments are brigaded together on service, or in camp, it is the guard pertaining to the camp and brigade headquarters. See GUARD.

MAINLAND, mān'land, or POMONA. The largest of the Orkney Islands (q.v.).

MAINLAND. The largest of the Shetland Islands (q.v.).

MAINPRIZE, or **MAINPRISE** (OF. *mainprise*, *meinprise*, surety, bail, from *mainprendre*, to take surety, from *main*, hand, from Lat.

manus, hand + *prendre*, to take, from Lat. *prendere, prehendere*, to seize, from *præ*, before + **hendere*, Gk. *χανδάνειν*, *chandanein*, to seize; ultimately connected with Eng. *get*). In English law, a proceeding by which a person was temporarily released from prison upon an undertaking being given by one or more responsible persons, known as mainpernors, to produce him at the trial. It was very ancient in its origin and was common in the reign of Edward I. It differed from bail in that the mainpernors had not the custody of the released prisoner and could not surrender him up at discretion as in case of bail. The practice is now obsolete, having been superseded by bail (q.v.).

MAINTENANCE (OF., Fr. *maintenance*, from *maintenir*, to maintain, from Lat. *manu tenere*, to hold in the hand, from *manu*, abl. sg. of *manus*, hand + *tenere*, to hold). In its legal sense, an officious intermeddling by a person in litigation in which he is not concerned or financially interested, by assisting either party with money or otherwise. It differs from champerty, in that, in order to constitute maintenance, it is not necessary that the offender shall bargain for a part of the proceeds on the contingency that the person assisted is successful. It is punishable as a crime at common law on the theory that it tends to increase groundless and vexatious litigation and to obstruct the administration of justice. The early common law carried the doctrine to extremes, and it was formerly dangerous for a man to advise a friend to consult a lawyer to protect his rights, but it has been greatly modified in the course of time, and to-day where the common-law rules prevail, the intention with which the assistance is given is considered the gist of the offense. Thus, in such jurisdictions if one assists a relative or even a friend to carry on litigation solely because of the relationship existing between them, and is not actuated by malicious motives against the opposite party, he is not guilty of maintenance. At common law a civil action for damages may be brought by the injured party against such an offender, and such right still exists in many jurisdictions where maintenance as a criminal offense is no longer recognized. In New York the common-law rules above mentioned do not exist to-day, but by statute a person is prohibited from taking title to lands which are the subject of legal controversy, and an attorney cannot buy or take an assignment of a claim for the purpose of prosecuting it by action. In several other States it is not recognized as a criminal offense and probably not as a civil cause of action. In the United States generally, however, agreements between attorney and client for fees contingent upon the success of the action are enforced, even where they have amounted to one-half of the amount recovered. See Barratry; Champerty. Consult the authorities referred to under Criminal Law; Tort.

MAINTENON, măn't'-nôn', Françoise d'Aubigné, Marquise de (1635-1719). Second wife of Louis XIV. She was the daughter of Constant d'Aubigné and of Jeanne de Cardillac, and granddaughter of Théodore Agrippa d'Aubigné, the famous Protestant champion. She was born November 27, 1635, in the prison at Niort, where her parents were then incarcerated. On obtaining their release, her parents went to Martinique, where the father died in 1645. After her father's death, Françoise returned to France with her mother, after whose death her father's sisters took her under their care, and educated her in a convent, where her conversion to the Roman Catholic religion was accomplished at the age of about fourteen. When she was sixteen, she became acquainted with the poet Scarron (q.v.), who, struck by her beauty, intelligence, and helpless condition, offered her his hand, or, if she should prefer it, a sum of money sufficient for her entrance into a nunnery. Although Scarron was lame and deformed, she chose to marry him, and lived in the midst of the intellectual society which frequented the house of the poet. On his death in 1660, she was reduced to great poverty; but through the intervention of Madame de Montespan (q.v.) obtained a pension from the King. In 1669 she was intrusted with the education of the two sons whom Madame de Montespan had borne to Louis XIV., and in this capacity attracted the attention of the King by her excellent intellectual gifts, finally supplanting Madame de Montespan in the changeable monarch's regard. War between the two women resulted in the triumph of the new favorite. The King bestowed on her the sum of 100,000 livres, with which she bought the estate of Maintenon and in 1675 received the title of marquise. She was not, it is believed, Louis's mistress in the ordinary sense of the term, but from that time to the end of his life she exercised an extraordinary ascendency over him. She had become an ardent Catholic and succeeded in bringing the King under the influence of religious teachings. She favored the revocation of the Edict of Nantes, but was opposed to the violent persecutions that followed it. Louis privately married her in 1684, soon after the death of the Queen, and, though she was never publicly acknowledged as his wife, her position at Court was quite different from that of her predecessors in the favor of the King. She carefully brought up the children of Madame de Montespan; and it was at her instigation that Louis legitimatized them. When he died in 1715, she retired to the former Abbey of Saint Cyr, which, at her wish, had been changed thirty years before into a convent for young ladies. Here she died, April 15, 1719. She received to the end of her life the honors of a King's widow. Consult: Geffroy, *Mme. de Maintenon d'après sa correspondance authentique* (Paris, 1887); Noailles, *Histoire de Mme. de Maintenon* (Paris, 1848-58); Read, "La petite-fille d'Agrippa," in the *Bulletin historique du protestantisme français*, vols. 36 and 37; Brunetière, "Mme. de Maintenon," in the *Revue des Deux Mondes* (Paris, 1887); Tapham, "Mme. Maintenon," in the *Revue Historique* (Paris, 1895).

MAINZ, mīnts (Fr. *Mayence*). The largest town in the Grand Duchy of Hesse, and one of the most ancient cities of Germany, and a great fortress of the Empire (Map: Germany, C 4). It is situated on the left bank of the Rhine at its confluence with the Main, about eighteen miles northwest of Darmstadt. The southern and older part of the city, with its narrow and irregular streets and Gothic buildings, presents a striking contrast to the modern quarters in the north, built up since the reconstruction of the fortifications. A modern bridge connects Mainz with

Kastel on the opposite side, and a fine esplanade extends along the river.

In the centre of the old town stands the cathedral, imposing in appearance and showing in its numerous additions and alterations traces of an eventful existence. It was constructed in 978-1008, but the present building dates principally from the thirteenth century, the original structure having been destroyed by several conflagrations. It is Gothic and is surmounted by six towers, of which the highest rises to 270 feet. Noteworthy features are the tenth-century brazen doors of the main entrance and the numerous tombs of the archiepiscopal electors. The cathedral was restored in 1856-79. The Church of Saint Stephen (1257-1328) merits mention, with its sightly situation above the Rhine and interesting cloisters. On the Gutenberg-Platz, near the cathedral, stands a Thorwaldsen monument to Gutenberg, a native of Mainz.

Facing the Schloss-Platz is the former electoral palace, now used as a museum. It is a red sandstone building of large proportions, begun in the seventeenth century. It contains one of the most extensive collections of Roman and Germanic antiquities in Germany, the municipal library of about 180,000 volumes, and numerous manuscripts, a rather unimportant picture gallery, and the Gutenberg Museum, founded in 1901. The former lodge of the Teutonic Order (1731-39) is now used as a grand-ducal residence. Mainz has also a number of fine modern buildings, notably the city hall, the theatre, and the central railway station.

The fortifications, enlarged since 1871, consist of several lines of bastioned forts, the citadel in the southeastern part of the town, and a number of detached forts. Kastel, on the opposite side of the Rhine, forms the *tête de pont*. There are numerous Roman remains in the town and the vicinity, including parts of an aqueduct and what is supposed to be a monument to Drusus. The chief educational institutions comprise two gymnasia, a seminary for priests, a school of commerce, and a number of other special schools. The university founded in 1477 was abolished in 1798.

Mainz is well known for its leather goods and furniture, and it manufactures also musical instruments, carriages, carpets, and chemicals. Book and art publishing is also carried on extensively. Mainz is well adapted for commerce by its position at the confluence of two important waterways; but the competition of other Rhine ports has detracted somewhat from its prominence in trade. The city is still, however, an important factor in the Rhine traffic with the Netherlands and Belgium. Population, in 1890, 72,059; in 1900, 84,251, including about 50,000 Catholics, 31,000 Protestants, and 3000 Jews.

The site of Mainz was occupied in ancient times by a Celtic settlement, which was later converted into a Roman camp. Drusus erected here in B.C. 13 a castle called Maguntiacum, and the settlement was connected by a bridge with the Castellum Mattiacorum (modern Kastel) on the opposite shore. With the dissolution of the Roman Empire Mainz was repeatedly pillaged by the Allemanni, the Vandals, and the Huns, but it gradually recovered, and by the tenth century was regarded as an important city. It obtained privileges from Charlemagne and headed the league of Rhenish towns in the thirteenth century. In the fifteenth century Mainz acquired great celebrity on account of Gutenberg, and became the centre of early book printing.

The decline of the city began in the second half of the fifteenth century, when it was deprived of its Imperial privileges for its support of the Archbishop Diether von Isenburg and became an archiepiscopal city. In 1797 the city, deserted by the Prince-Elector and the Court, capitulated to the French under General Custine, was retaken in the following year, and formally ceded to France by the Peace of Lunéville in 1801. It was returned to Germany by the Peace of Paris in 1814, and was annexed to the Grand Duchy of Hesse in 1816, remaining, however, a fortress of the German Confederation.

The archbishopric of Mainz was founded in 747 with Saint Boniface as its first archbishop. The archbishops of Mainz were preëminent among the spiritual electors of the Empire. The archbishopric was degraded to a bishopric in 1801, and the see was secularized in 1803.

MAIOLICA, mȧ-yō̆′lē̇-kȧ. See MAJOLICA.

MAIORESCU, mī′ô-rĕsh′, TITUS (1840—). A Rumanian statesman and writer, born at Krajova. He studied law and philosophy at Vienna, Berlin, and Paris, and in 1862 took the chair of philosophy at Jassy and afterwards the same position at Bucharest. He was diplomatic agent of Rumania in Berlin in 1876, Minister of Public Instruction in 1874-76 and 1888-89, and Minister of Justice in 1900-01. His works include: *Einiges Philosophische in gemeinfasslicher Form* (Berlin, 1861); *Poesia rumana* (1867); *Observari polemice* (1869); *Despre scrierea limbei romane* (1874); and *Logica* (2d ed. 1886).

MAIPO, mī′pô, or **MAIPU**, mī′po͞o. A river of Chile, rising in the Andes and flowing westward 120 miles into the Pacific Ocean (Map: Chile, C 10). It passes a few miles south of the city of Santiago. On its banks was fought on April 5, 1818, the decisive battle which secured the independence of Chile.

MAIPURE, mī-po͞o′rȧ. A prominent and populous group of tribes of Arawakan stock (q.v.), formerly dwelling on the Venturi River, an upper affluent of the Orinoco, in Southern Venezuela. Two centuries ago they were one of the leading mission tribes of the Orinoco region, but, like many others, gradually wasted away before the incessant inroads of the Caribs, who were accustomed to make periodical expeditions up the river in fleets sometimes of a hundred canoes, destroying every village along its banks.

MAIR, mâr, CHARLES (1840—). A Canadian poet and journalist of Scotch descent, born in Lanark, Ontario. He published a volume entitled *Dreamland and Other Poems* (1868), and *Tecumseh, a Drama* (1886). He lived in the Northwest Territory during the first and second Riel rebellions, which he helped to suppress, and he was Fort Garry correspondent of the Montreal *Gazette*.

MAIRET, mâ′rā′, JEAN DE (1604-86). A French dramatic poet, born at Besançon. His earlier dramas include: *Silvanire* (1625); *Les galanteries du duc d'Ossone* (1627), a comedy modeled on the Italian order; and *Sophonisbe* (1629), the first of French classical tragedies to be given on the regular stage. His other works are of little importance. He became involved in the quarrel that followed the presentation of the *Cid* (1637), and Mairet and Scudéry were Corneille's bitterest opponents.

MAIS, mā'ĭs. One of the Pleiades and mother by Zeus of Hermes. She was identified by the Romans with Bona Dea.

MAISCH, mâsh, John Michael (1831—). An American pharmacist, born in Hanau, Germany. He was educated in his native town, and came to the United States in 1849. In 1861 he was appointed professor of materia medica in the New York College of Pharmacy, and later of materia medica and botany at the Philadelphia College of Pharmacy. He became editor of the *American Journal of Pharmacy;* assisted in the preparation of *Griffith's Universal Formula* (3d ed. 1874); with Stillé, edited the *National Dispensatory* (4th ed. 1879-86), and *Manual of Organic Materia Medica* (3d ed. 1882-87).

MAISON, mâ'zôN', Nicolas Joseph (1771-1840). A French marshal, born at Epinay (Seine). He distinguished himself at Austerlitz in 1805 and was prominent in the campaigns that followed that battle, but did not attain the rank of general of division until 1812. In 1813 he was at the head of the Army of the North and maintained a sturdy resistance against the Allies. After Napoleon's abdication he attached himself to the Government of Louis XVIII., was made a peer, appointed Governor of Paris in 1815, and became a marquis in 1817. During the expedition to Morea in 1828, which he commanded, he received the baton of marshal. He was for a short time Minister of Foreign Affairs in 1830, and afterwards Ambassador to Vienna (1831), to Saint Petersburg (1833), and Minister of War (1835-36).

MAISON CARRÉE, mâ'zôN' kâ'râ'. A beautiful and well-preserved Roman temple at Nîmes, France, dating probably from the time of the Antonines. The building is of Corinthian architecture, and measures 45 by 85 feet. It stands on a platform approached by fifteen steps. It is surrounded by thirty columns, of which six form the façade, and twenty are engaged in the walls of the cella. After serving as a church and for other uses it is now used as a museum.

MAISON DORÉE dô'râ' (Fr., gilded house). A famous Parisian restaurant on the Boulevard des Italiens, built in 1839; and long a chosen resort of the fashionable world. Like all the renowned houses of entertainment that formed a distinctive feature in the life of Paris in the nineteenth century, it maintained a high schedule of charges. When in recent years the former extravagance in dining passed away, such establishments ceased to be profitable. and in 1903 the Maison Dorée was compelled to close its doors.

MAISON DU ROI, du rwä (Fr., house of the King). A title applied during the monarchical régime in France to a select corps of troops, including the Gardes du Corps. Chevauxlégers, Mousquetaires, Grenadiers à Cheval. the French and Swiss Guards, and the Cent Suisses. During the reign of Louis XIV. they were entirely separate from the regular army establishment. They corresponded to the present Household Troops (q.v.) of England.

MAISONNEUVE, mâ'zô'nẽv'. Paul de Chomedey, Sieur de (?-1676). A French colonial Governor in Canada, born in Champagne. He early entered the French Army and served in many campaigns in Holland. He became interested in the attempt to found a religious colony in New France by the body afterwards known as the Associates of Montreal, and in 1641 with forty men and four women reached Quebec. The next year the city of Montreal was founded. Troubles came fast, and all his wisdom and firmness were necessary to keep the colony on its feet. The patrons had no conception of its economic needs, as they were moved entirely by religious enthusiasm. He was continued as Governor after the colony came under Sulpitian auspices, though much harassed by the Government at Quebec, which resented the virtual independence of Montreal. On this account he was removed by De Tracy in 1665 and sent to France, where he died in obscurity. He was a brave, disinterested man, who gave all his energies to the service of the colony.

MAISTRE, mâ'tr', Joseph de, Count (1754-1821). A French philosopher and political writer, and statesman in the service of Sardinia, born in Chambéry of a noble French family that had settled in Savoy when it belonged to the Sardinian Kingdom. Driven from his native country by the invasion of the French (1792), De Maistre, who was a member of the Senate, escaped to Turin, and when, in 1798, the King was compelled to abandon his Continental possessions, De Maistre accompanied the Court to the island of Sardinia. From 1803 to 1817 he represented his impoverished King at Saint Petersburg, and upon his return was appointed Minister of State and Regent of the Grand Chancery. De Maistre was an ardent advocate of legitimacy, and in his later career became one of the most eminent writers of the new (or liberal) conservative school in politics and religion, of which Chateaubriand may be regarded as the head. His first work of note was *Considérations sur la France* (1796), in which he combated the revolutionary doctrines then in vogue. His later works include: *Essai sur le principe générateur des constitutions politiques* (1810), advocating an absolute monarchy; *Du pape* (1819), probably the best modern defense of the spiritual and temporal power of the Pope; and *De l'église gallicane* (1821-22). His *Les soirées de Saint Pétersbourg* (1821), *Examen de la philosophie de Bacon* (1836), *Lettres et opuscules inédits du comte Joseph de Maistre* (1851), and *Mémoires politiques et correspondance diplomatique* appeared posthumously. *Quatre chapitres inédits sur la Russie par le comte Joseph de Maistre* (1859) was published by his son Rodolphe. There are also editions of his *Œuvres complètes* (1864) and *Œuvres posthumes* (1864). Consult: Margerie, *Le comte Joseph de Maistre* (Paris, 1890); Lescure, *Le comte Joseph de Maistre et sa famille* (Paris, 1893); Descostes, *Joseph de Maistre avant la révolution* (Paris, 1893); id., *Joseph de Maistre pendant la révolution* (Paris, 1895); and Mandoul, *Maistre et la politique de la maison de Savoie* (Paris, 1900).

MAISTRE, Xavier de (1763-1852). A French essayist and novelist, brother of Joseph de Maistre (q.v.). Having been in the military service of Sardinia, on its conquest by the French he emigrated to Russia (1799), where he became major-general and took part in the Persian campaign, gathering there materials for his most famous story, *Les prisonniers du Caucase* (1825). His first book, *Voyage autour de ma chambre* (1794), was written in the style of Laurence Sterne, in Turin, while De Maistre was under arrest for participation in a duel. The *Expédition nocturne autour de ma chambre* (1825), in like style, was less successful. He wrote also two stories, *Les lépreux de la cité d'Aoste* (1811) and *Prascovie, ou la jeune Sibérienne* (1825), imitated from Madame Cottin's once noted *Les exilés de Sibérie* (1806). De Maistre's essays are a genial afterglow of eighteenth-century wit, and his stories are models of vigorous and direct narration, combining power of exact description with sentimental affectation in a way that puts him quite apart among the French novelists.

MAISUR, mī-sōōr′. See Mysore.

MAITLAND, māt′land. A town of New South Wales, Australia, in Northumberland County, on the Hunter River, 95 miles north of Sydney, and 13 miles northwest of Newcastle, to which it is joined by railway (Map: New South Wales, F 3). It is divided by the river into East and West Maitland, two distinct municipalities. In either division are handsome banks, churches, and other public buildings. In West Maitland, the more populous part, are several coach-building factories, tobacco factories, and several mills, including a paper mill. Good coal is mined in the neighborhood. The district is called the 'granary of New South Wales,' and an extensive trade is carried on in agricultural produce. Total population of East and West Maitland, in 1895, 10,800; in 1901, 10,085.

MAITLAND. The family name of the Earls and Dukes of Lauderdale (q.v.).

MAITLAND, Frederick William (1850—). A celebrated English historian. He was educated at Eton and at Trinity College, Cambridge. After graduation he studied law, and in 1884 he became reader of English law at Cambridge. In 1889 he was chosen professor of the same subject. His writings are almost entirely on the early legal institutions of England, and have exerted a great influence in this field upon English and American students. His greatest work is the *History of English Law*, the first edition of which appeared in 1895. In this he was assisted by Sir F. Pollock. The work extends to 1307, and cleared up a great number of problems, as did also his series of essays known as *Domesday Book and Beyond* (1897). Another interesting work of Maitland is *Roman Canon Law in the Church of England* (1898)—a collection of essays, in which he undertakes to refute the claims of the High Church Party, who maintain that the canon law of Rome was never binding on the ecclesiastical courts of England. For the names of the other works of Maitland, consult Gross, *Sources and Literature of English History* (London and New York, 1900).

MAITLAND, John Alexander Fuller. See Fuller-Maitland, John Alexander.

MAITLAND, Sir Peregrine (1777-1854). A British general and colonial administrator, born at Longparish House, Hampshire. In 1814 he was made a major-general, and in 1815 took part in the Waterloo campaign. He was Lieutenant-Governor of Upper Canada in 1818-28, but his inexperience in civil government led him to rely too much upon his councilors, while his want of tact and autocratic Toryism rendered him unpopular with the mass of the Canadians. The only important event of his administration was the beginning of the Welland Canal. After leaving Canada he was Governor of Nova Scotia from 1828 to 1834, though he spent but one of those years at his post. In 1830 he was promoted lieutenant-general; he was commander of the Madras army in 1836-38, and Governor-General at the Cape of Good Hope in 1843-46.

MAITLAND, Sir Richard, Lord Lethington (1496-1586). A Scottish lawyer and antiquary of an Anglo-Norman family long settled in Berwickshire. His father, Sir William Maitland of Lethington, was killed at Flodden. Richard Maitland was educated at the University of Saint Andrews and studied law in Paris. Returning to Scotland, he was nominated heir to his father, and entered the service of James V. During the troubled years that followed the death of the King he aimed at an independent course. As a commissioner in settling disputes on the borders he became famous. On Queen Mary's return from France in 1561 he became an ordinary Lord of Session and a member of the Privy Council, and the next year he was appointed Keeper of the Great Seal. Though totally blind, he held the seal till 1567, and his position on the bench till 1584. He died March 20, 1586. Maitland is remembered mainly for his valuable collection of early poems, in two volumes, now preserved at Magdalen College, Oxford. Selections from it were published by John Pinkerton under the title, *Ancient Scottish Poems Never Before Published* (1786). Maitland's own poems, which possess considerable interest, were published with a memoir in 1830 by the Maitland Club, a society founded at Glasgow in 1828 for printing ancient Scottish manuscripts.

MAITLAND, Samuel Roffey (1792-1866). A Church of England scholar. He was born in London and studied at Trinity College, Cambridge, without graduation, as he was not a member of the Church of England. He studied law and was admitted to the bar in 1816, then studied theology and was ordained in 1821. He held perpetual curacy of Christ Church, Gloucester, 1823-29, but resigned to devote himself to literature. In 1838 he was appointed librarian to Dr. Howley, Archbishop of Canterbury, and keeper of the Lambeth manuscripts, retaining the office until the death of the Archbishop, in 1848. From 1839 to 1849 he edited the *British Magazine*, in which he wrote valuable articles, chiefly on prophecy, Church history, criticism, etc. His principal historical works are: *An Inquiry into the Grounds on which the Prophetic Period of Daniel and Saint John Has Been Supposed to Consist of 1260 Years* (London, 1826); *Facts and Documents Illustrative of the Doctrines and Rites of the Ancient Albigenses and Waldenses* (1832); *The Voluntary System* (1834); *The Dark Ages: A Series of Essays Intended to Illustrate the State of Religion and Literature in the Ninth, Tenth, Eleventh, and Twelfth Centuries* (1844); *Essays on Subjects Connected with the Reformation in England* (1849); *Superstition and Science* (1855). He wrote also numerous pamphlets, letters, and reviews.

MAITLAND, William (1528?-73). A Scotch statesman, better known as 'Secretary Lethington.' He was the eldest son of Sir Richard Maitland (q.v.), of Lethington. He was educated at Saint Andrews and on the Continent, and quickly displayed great aptitude for a political career. He became a convert to the Reformed doctrines about 1555, but could not have been a violent partisan, since in 1558 he was appointed Secretary of State by Mary of Guise. In the following year, however, he openly joined the lords of the congregation, and was one of the Scotch commissioners who met the Duke of Norfolk at Berwick to arrange the conditions on which Queen Elizabeth would give them assistance. In 1561, after the arrival of Queen Mary from France, he was made an extraordinary Lord of Session. He strongly objected to the ratification of Knox's *Book of Discipline*, and in 1563 conducted the prosecution raised against Knox for treason; from this time he appears to have split with the Reformers. In 1564 he held a long debate with Knox on the claims of the Reformed Church to be independent of the State. In 1566 he took part in the plot against Rizzio, after whose assassination he was proscribed and obliged to seek shelter for some months in obscurity. He was cognizant of Bothwell's scheme for the murder of Darnley; yet when he saw the hopeless nature of Bothwell's designs, he immediately joined the confederacy of the lords. While Mary was still a prisoner at Lochleven he is said to have written to her offering his services, yet he was present at the coronation of King James VI., 1567; and although he secretly aided in the escape of the Queen, he fought against her on the field of Langside. In 1568 he accompanied the regent Murray to the conferences held at York regarding the Scottish Queen; but even here he tried to further her interests, and is said to have been the first to propose to the Duke of Norfolk a union between him and Mary. The Scottish lords felt that he was a dangerous enemy to the commonwealth, and in 1569 he was arrested at Stirling for complicity in Darnley's murder, but was liberated shortly after by an artifice of Kirkaldy of Grange. After the murder of the regent Murray he and Kirkaldy became the leaders of the Queen's party, in consequence of which he was declared a rebel, deprived of his offices and lands by the regent Morton, and besieged, along with Kirkaldy, in Edinburg Castle. After a long resistance, the castle surrendered, and Maitland was imprisoned in Leith, where he died (1573). Buchanan drew his character with a severe pen in *The Chameleon*. Consult: Chalmers, *Life of Mary, Queen of Scots* (3 vols., London, 1822); Skelton, *Maitland of Lethington* (London, 1887-88).

MAÎTRE D'ARMES, må'tr' därm (Fr., master of arms). A fencing master. In the French Army a maître d'armes is assigned to each regiment. See Fencing.

MAÎTRE DE FORGES, de fôrzh, Le (The Iron-Founder). A romance by Georges Ohnet (1882). The heroine, Claire de Beaulieu, loves her cousin, who marries another when Claire's fortune is suddenly lost without her knowledge. In pique she marries Derblay, but makes no effort to conceal her repugnance for him. He endures the false situation until his duel with his wife's cousin reveals the delicacy of his conduct and earns her love. This mediocre romance had an extraordinary success in many translations as well as in the original. It was dramatized by the author and presented at the Gymnase in 1883.

MAITREYA, mī-trā'yȧ. A proper name derived from Sanskrit *mitra*, 'friend,' and designating in its Pali form *Metteyya*, the future Buddha, the Buddha of Friendship, who will appear 5000 years after Gautama. At present he is believed to be in the Tushita Heaven of the Blest. He is known in Tibet as Jampa (Tib. *Byams-pa*, pronounced Jam-pa or Cham-pa) and is believed to be of gigantic size, so that colossal statues are used to represent him. Consult: Rhys, David, *Buddhism* (London, 1900); Schlagintweit, *Buddhism in Thibet* (ib., 1868); Waddell, *The Buddhism of Tibet* (ib., 1895).

MAIZE (Sp. *maiz*, from Haitian *mahiz*, *mahis*, the native name), or Indian Corn (*Zea Mays*). An annual grass with erect stems and spreading leaves; male or staminate flowers borne upon the summit of the stem, which is commonly designated the tassel; and the female flowers upon the ear, which rises from the axils of the leaves. The protruding styles of the female flowers are called the silk, and the united pistillate spikes the cob. Fertilization of the pistillate flowers is accomplished by the wind or other agencies, which carry pollen from the staminate flowers to the silk. The botanical relationship of maize is shown in the discussion of grasses. Its nearest relative is probably the Mexican teosinte (*Euchlæna luxurians*), a plant of the same general habit of growth. Experiments conducted by Harshberger and others have seemed to show that the wild form (which is unknown), or the plant from which maize was derived, is the teosinte. Maize differs from most grasses in having solid instead of hollow stems. Adventitious roots are often developed from the nodes near the ground which serve to brace the plant against winds. The plant varies in height from less than two feet in dwarf varieties to more than thirty feet, reported for some forms in the West Indies. Specimens more than twenty feet tall are not infrequent in the rich river valleys in the United States. The size of the ear and size, color, and hardness of the grain show marked variation. Ears vary in length from an inch in varieties of popcorn to fifteen inches or more in the dent varieties. White, black, yellow, and red, with numerous variants, are the colors of the grain. In some the grain is no larger than rice grains; in a South American variety, cuzco, the individual grains often weigh thirty-five times as much as the small popcorn grains. All degrees of hardness are shown, ranging from the flint varieties (so called from their extreme hardness) to the squaw corn and flour corn, the grains of which are so starchy and soft as to be readily broken between the fingers. The season required for maturing varies from one month in a Paraguayan variety to seven months in others. Maize shows a remarkable tendency to 'mix,' as the blending of varieties is called, the pollen of one variety showing its effect upon the grain of another. This may be seen in the common occurrence of variegated grains and in the deterioration of sweet corn and popcorn when planted near field varieties. Abnormal forms are of frequent occurrence, as cobs with staminate flowers upon their extremities, small ears borne toward the bases of tassels, branched and flattened ears, etc.

Although the widespread cultivation of maize has given rise to very many varieties commonly grouped according to certain characters of the grain, most botanists recognize only a single species, *Zea Mays*, of very variable habit. Sturtevant, however, has given to the different groups the following specific names: *Zea tunicata*, pod corns; *Zea everta*, pop corns; *Zea indurata*, flint corns; *Zea inrentata*, dent corns; *Zea amylacea*, soft corns; *Zea saccharata*, sweet corns; and *Zea amyleasaccharata*, starchy sweet corns. The first group, *Zea tunicata*, or podded corn, which has a pod or husk for each kernel in addition to the enveloping ear leaves, is considered to be the original form of corn; *Zea everta*, or popcorn, its nearest relative; and *Zea amylacea*, or soft corn, the highest developed form. Millo maize, Jerusalem corn, Kafir corn, Egyptian corn, etc., are not varieties of *Zea Mays*, but of Andropogon, and are known as non-saccharine sorghums.

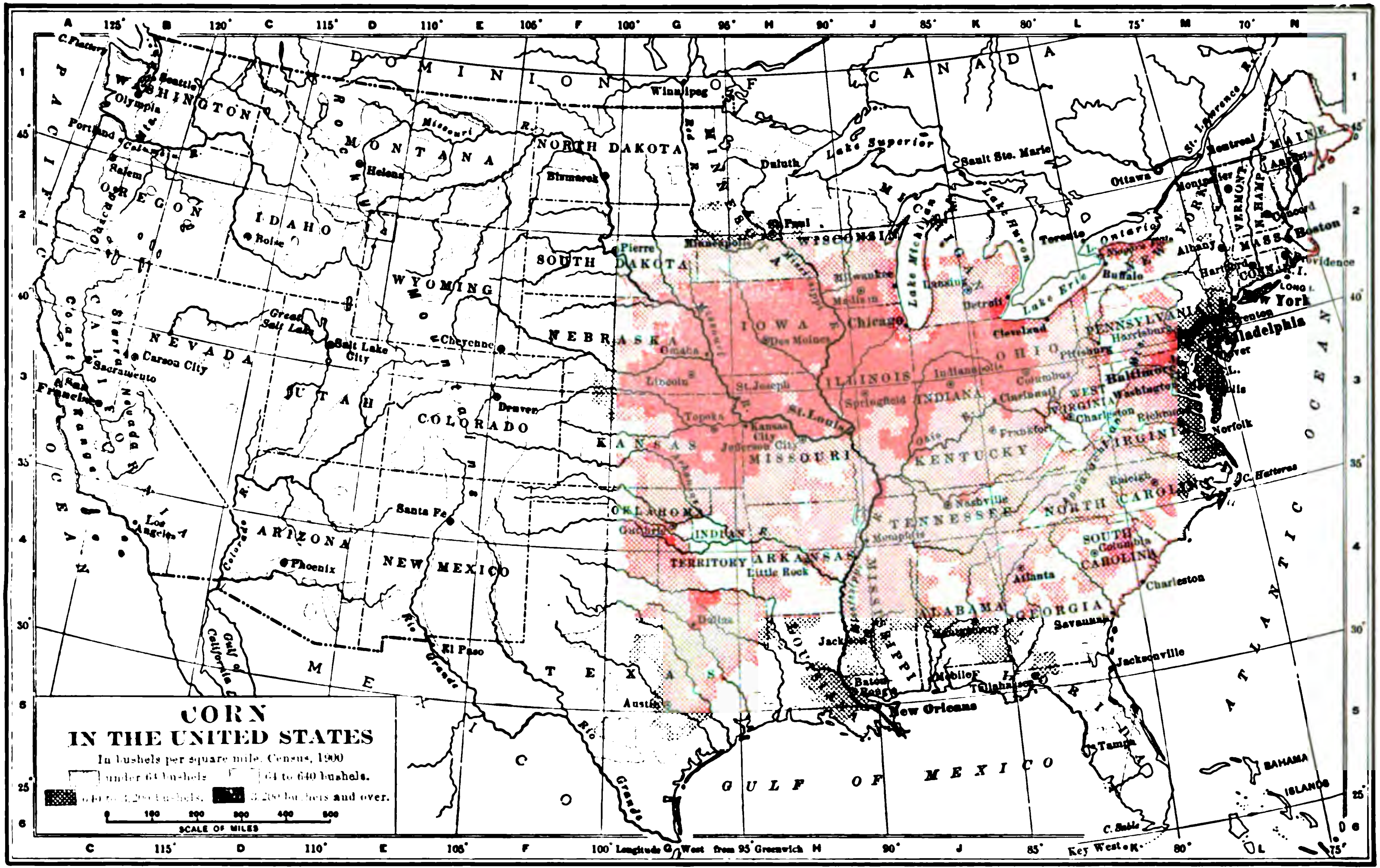
Corn is generally thought to be a native of America, probably grown in a wild state on the plateaus of tropical America. All evidence points to its cultivation by the native tribes long before the discovery of the country by Columbus, who is said to have carried the first grains of corn to Europe on his first return voyage. Its cultivation in Europe spread very slowly. Although introduced into Spain at the end of the fifteenth century, it did not reach France until a hundred years later. Historical data concerning its distribution in Europe are conflicting in many instances, but modern agricultural writers, summing up the evidence at hand, believe it was introduced into France and Italy from Spain, into Switzerland and Hungary from Italy, into Austria and Southeastern Europe from Hungary, and from Switzerland into the valley of the Rhine. It is said to have been carried to Asia and Africa from Portugal. The distribution of maize on the American continents has been coincident with the progress of the white race in the New World. The limits of the distribution of corn culture are given by De Candolle as 40° S. latitude in South America, 54° N. latitude in North America, and 50° N. latitude in Europe. The popcorn (see below), flint corn, dent corn, and sweet corn groups are represented in the United States by many varieties, the dent corn representing the bulk of the corn produced. In Europe the flint corns are more widely distributed than any other group. Flint corn in numerous varieties has a large, hard kernel, either white, yellow, orange, red, blue, striped, or blazed. The ears are usually from six to twelve inches long and the plants commonly grow from four to eight feet high. Dent corn is characterized by the indentation at the top of the kernel caused by the drying and shrinking of the starchy matter within. The outer portion of the kernel is corneous as in the pop and flint corns, but the proportion of starch is greater in this group than in either of the other two. The length of the ear usually varies from six to twelve inches and the height of the plant ordinarily from six to ten feet. Most varieties have white or yellow kernels, but various other colors are represented among the many different sorts. The varieties of dent corn exceed in number those of all the other groups combined.

Corn is a universal crop in the United States and is grown on many different kinds of soil, but for its best growth a well drained, rich, sandy loam, which does not bake during drought, is required. In preparing the soil for corn it is plowed deeper than for any other cereal crop, the object being to obtain a deep and well pulverized seed-bed. In the northern portion of the Mississippi Valley, where the bulk of the world's corn crop is produced and where it matures in about five months, it is planted from about May 1st to the 20th. In other latitudes planting is done late enough to escape late spring frosts. It is most commonly sown in hills or in drills by means of a corn-planter, but it is sometimes also sown broadcast. The hills are about three and one-half feet apart each way, and three or four stalks are produced per hill; but when planted in drills single plants are grown about one foot apart in the row. From the time of planting until the young plants appear above ground the soil is harrowed for the purpose of keeping the surface in a pulverized condition and preventing the growth of weeds. The plants are cultivated with the horse hoe or corn cultivator after they have attained sufficient height and until they are too large to admit of further cultivation without injury to the plants. In the principal corn-producing States of the United States cultivation usually commences about the first of June, and lasts for about six weeks. Where corn is grown in hills, or checks, the direction of each cultivation is given at right angles to the preceding direction, so that the whole of the surface soil may be stirred. Planted in drills it can be cultivated in one direction only.

The practice of listing corn consists in making alternate ridges and furrows and drilling the corn into the furrows instead of plowing the land. This is done by means of the lister, an implement which ridges the soil and drills the corn at the same time. In cultivating listed corn the soil is thrown from the ridges toward the growing plants, so that by the time cultivation is finished the surface of the land has become level. The practice of listing is not general.

The time of harvesting depends somewhat on the use to be made of the crop. When grown for fodder corn is cut when the kernels begin to glaze and the lower leaves begin to dry. The cut stalks are put up in shocks and left to cure in the field. When dry the ears are removed and the stalks (fodder or stover) are used directly for feeding purposes or shredded and then fed. Shredding consists in passing the stalks and leaves through a machine which cuts and tears them into fine pieces. A machine known as the shredder and husker removes the ears and shreds the stalks and leaves. Corn grown for the grain is harvested when it is fully ripe and dry. The ears are gathered, husked, and stored in slat cribs, through which the air passes freely, thus drying the corn and preventing attacks of mold. This method of harvesting corn is known as husking, picking, or shucking, the first being perhaps the most common. The term 'snapping' corn refers to gathering the ears with most of the husks attached, which is sometimes done when ripe corn is fed directly from the field. Before it is fed or sold corn is usually shelled by passing the huskless ears through hand, horse, or steam power corn-shellers.

The most common disease to which corn is



CORN IN THE UNITED STATES

In bushels per square mile. Census, 1900

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subject is smut (q.v.), against which methods of prevention are not well understood. Rust does no material injury to corn. The bacterial disease of corn sometimes does considerable damage. The principal insect enemy is the cut-worm, which destroys the young plants. Extensive injury is frequently done by ground squirrels, which feed on the planted seed. These animals are usually poisoned about planting time with poisoned corn and pumpkin seeds.

The maize crop of the world is estimated at from 2500 to 3000 million bushels annually. The annual corn production of the United States amounts to about 2000 million bushels. The great corn-producing States are Illinois, Iowa, Kansas, Nebraska, Missouri, and Indiana. In 1899 these States produced 1,256,162,321 bushels, or nearly three-fifths of the entire crop of the United States. About fifty bushels per acre is considered a good yield, but the average yield per acre for the whole United States is only about twenty-five bushels. The largest yield of corn on record, 237 bushels per acre, was produced in South Carolina.

Corn is utilized in the preparation of more than one hundred different articles. Its chief value is as food for man and domestic animals. For feeding purposes the entire plant is used either as it comes from the field or prepared in various ways to make it more palatable and to minimize the amount of waste in feeding (see below). The husks are used in making mattresses, especially in the corn-growing regions. The outer portion of the stalk is used in paper manufacture, and the pith is employed in making pyroxylin varnishes, guncotton, and other high explosives. Owing to its great resilience, porosity, and absorptive power, the pith is also used in the construction of war vessels, compressed blocks of it being packed behind the outer armor plate to absorb the water and close the aperture in case the plate is pierced by a projectile. The cobs are often ground up for feed, but they are generally used for fuel and are also employed to a considerable extent in the manufacture of tobacco pipes. The principal and most common product of the grain is the flour, or cornmeal, which is either white or yellow, according to the variety of corn from which it is made. Nearly all the starch and large quantities of glucose, whisky, and alcohol manufactured in the United States are made from corn. In connection with the manufacture of these various substances a number of by-products are obtained which are generally used for feeding purposes. (See GLUTEN MEAL AND GLUTEN FEED). Maize or corn oil is obtained from the germ which is extracted from the kernel in the manufacture of starch, glucose (q.v.), and some kinds of meal. The oil expressed from the germ is a light, clear, amber-colored fluid, which may be used for culinary, mechanical, and lighting purposes. It is used to some extent in the manufacture of soap and of a substitute for rubber.

SWEET CORN or SUGAR CORN (*Zea saccharata*), generally considered a garden vegetable, is extensively grown in home gardens and for marketing and canning. As a vegetable it is used while the kernels are plump and well filled out but still containing milky juice. The ripened kernels have a wrinkled appearance. Sweet corn is adapted to any soil suitable for field corn, though more attention is given to manuring. A warm, rich, sandy loam is considered most desirable. On the northern limits of the corn belt sweet corn is grown as a field crop because of its rapid growing and early maturing habits. Some of the smaller and earlier sorts develop in seventy days; the later varieties require 90 to 100 days. The amount grown for canning purposes in 1898 has been given at 4,398,563 cases, each containing two dozen two-pound cans. Corn for canning is grown mostly in New York, Maine, Illinois, and Iowa.

POPCORN (*Zea everta*) is characterized by small ears, scarcely exceeding six inches in length and 1½ inches in diameter, small kernels, and an excessive portion of hard, flinty endosperm in the seed. This latter is supposed to give the property of popping, which is the complete turning inside out of the kernel on the application of heat. Through popping the kernels become very much enlarged, so that a pint of kernels before popping makes six to eight quarts after popping. The popped kernels are pure white and are eaten out of hand or mixed with syrup and pressed into balls or cakes to be eaten like confectionery. Popcorn requires about the same soil and treatment as field corn.

FEEDING VALUE AND USES OF MAIZE AS FOOD. Corn is of the greatest importance and is extensively used in the feeding of farm animals because of the variety and cheapness of feeding stuffs which it furnishes. The uncured plant in different stages of maturity is used as forage; corn shives (i.e. the stalks from which the pith has been removed) have recently been used to some extent; the ripened grain, whole or ground, is fed to all classes of farm animals, often on the cob and often ground with the cob as 'corn and cob meal;' various by-products from the manufacture of starch, glucose, corn 'breakfast foods,' etc., are also largely employed. As a food for man, corn is used cracked or crushed as hominy, and finely ground, both bolted and unbolted, as meal. From white corn flour is made by grinding the grain after the removal of the germ and some of the outer envelope.

The composition of these materials and some others mentioned later is shown in the table on the following page.

Like all green crops, corn fodder has a high water content. It owes its nutritive value principally to the carbohydrates which it contains. It is also useful as a feeding stuff, because it is succulent, gives necessary bulk to a ration, and is relished by animals. Dried corn fodder and stover are similar in composition to hay, and are very valuable feeding stuffs, but unless cut fine or shredded and otherwise properly handled, a considerable portion may be wasted when fed. It often lacks flavor, and since it is chiefly a carbohydrate food, a one-sided ration, it should be fed with material rich in protein (i.e. concentrated feeds). Its palatability may be increased by moistening with water and sprinkling with bran and steaming. The best results are said to be obtained when only about one-third of the coarse fodder consists of stover. According to reports of the United States Department of Agriculture, the corn stover crop of the United States in 1897 was nearly 80,000,000 tons, much larger than the hay crop.

Corn silage, which resembles the green crop in composition, is wholesome and is relished by farm animals. The grain is especially rich in

AVERAGE COMPOSITION OF A NUMBER OF CORN PRODUCTS

	Water	Protein	Fat	Nitrogen-free extract	Crude fibre	Ash
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Corn fodder (green)	79.3	1.8	0.5	12.2	5.0	1.2
Corn fodder (cured)	42.2	4.5	1.6	34.7	14.3	2.7
Corn stover	40.5	3.8	1.1	31.5	19.7	3.4
Corn silage	79.1	1.7	0.8	11.0	6.0	1.4
Corn shives	9.2*	6.4	2.8	48.9	28.7	4.0
Corn kernel, Dent	10.6	10.3	5.0	70.4	2.2	1.5
Corn kernel, Flint	11.3	10.5	5.0	70.1	1.7	1.4
Sweet-corn kernel	8.8	11.6	8.1	66.8	2.8	1.9
Popcorn kernel (raw)	10.8	11.2	5.2	69.6	1.8	1.4
Popcorn kernel (popped)	4.3	10.7	5.0	77.3	1.4	1.3
Corn-and-cob meal	15.1	8.5	3.5	64.8	6.6	1.5
Hominy chop	11.1	9.8	8.3	64.5	3.8	2.5
Corn germ	10.7	9.8	7.4	64.0	4.1	4.0
Gluten meal	8.6	30.0	8.8	49.2	2.6	0.8
Starch feed (wet)	65.4	6.1	3.1	22.0	3.1	0.3
Corn cob	10.7	2.4	0.5	54.9	30.1	1.4
Corn flour	12.6	7.1	1.3	77.5	0.9	0.6
Cornmeal, granular	12.5	9.2	1.9	74.4	1.0	1.0
Cornmeal, unbolted	11.6	8.4	4.7	73.0	1.0	1.3
Hominy	11.8	8.3	0.6	78.1	0.9	0.3
Sweet corn (green)	75.4	3.1	1.1	19.2	0.5	0.7
Corn starch	......	......	......	90.0		

* Dried artificially.

carbohydrates, principally starch, but contains considerable protein and some fat. Contrary to popular opinion, there is no marked difference in the composition and feeding value of white and yellow corn, or dent and flint corn. Individual specimens of either sort vary more widely than do the averages for the different groups. Corn is used in rations for maintenance, for the production of milk, for fattening, and for feeding draught animals. It is a universal feed for pigs in the United States, a bushel being considered sufficient when fed alone to produce on an average eleven pounds of pork. It is also widely used in fattening steers, beef cattle, and poultry, and is very satisfactory for the grain portion of a ration for horses, cows, and sheep. The commercial by-products like gluten meal are rich in protein and are valuable feeding stuffs. Corn cobs possess considerable nutritive value, and when ground with the kernel the resulting meal is highly valued. Corn products compare favorably as regards digestibility with other similar feeding stuffs. The coefficients of digestibility of a number of them follow:

AVERAGE COEFFICIENTS OF DIGESTIBILITY OF A NUMBER OF CORN PRODUCTS

	Dry matter	Protein	Fat	Nitrogen-free extract	Crude fibre	Ash
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Corn fodder (green)	67.8	59.7	74.1	73.7	60.2	36.6
Corn silage	70.8	56.0	82.4	76.1	70.0	30.3
Corn stover	57.2	35.9	70.4	57.9	64.2	32.6
Ground corn shives	58.1	46.7	78.2	60.5	57.0	38.7
Cornmeal	89.4	67.9	92.1	94.6	.....	......
Corn-and-cob meal	78.7	55.6	84.1	87.6	45.7	......
Corn cob	51.4	19.3	......	48.3	57.5	......
Gluten feed	86.3	85.6	84.4	89.2	78.0	......

Corn ranks high in comparison with other cereal grains as a food for man. Large quantities are eaten in the United States, in Southern and Eastern Europe, and in the Orient, but it is little known in Northern Europe. Cornmeal, made into corn bread, mush, and many other foods, is wholesome and nutritious. It cannot be leavened with yeast like wheat flour in breadmaking, as the corn does not possess gluten, and the proteids of the maize kernel have other properties than those which characterize gluten. Large quantities of corn are consumed in the form of hominy and other breakfast foods. So far as experiments show, corn is well assimilated by man, and, judged by composition, digestibility, palatability, and wholesomeness, is worthy of the high opinion in which it is held.

Green sweet corn, either fresh, canned, evaporated, or dried, commonly eaten as a vegetable in the United States, resembles other succulent vegetables in composition, being rich in carbohydrates. Popcorn, also widely used, closely resembles other varieties in composition, but after popping differs in composition from the raw chiefly in having a low water content. Corn starch and corn oil, manufactured products, are used in cookery, the former extensively.

In Italy a disease (*pellagra*) is attributed to the use of corn, which investigation seems to show is due to molding or spoiling of the grain. In the United States, where corn is most eaten, its wholesomeness is no more questioned than that of wheat, since, generally speaking, no evil results have attended its use.

For further details of corn culture, consult: Morrow and Hunt, *Soils and Crops of the Farm* (Chicago, 1892); *Corn Culture in the South*, Farmer's Bulletin 81, United States Department of Agriculture (Washington, 1898); for classification: Bulletin 57, Office of Experiment Stations (Washington, 1899); for composition of various parts of corn plant: Bulletin 50, Division of Chemistry (Washington, 1898); for feeding value, Henry, *Feeds and Feeding* (Madison, Wis., 1898); and Bulletin 15 of Office of Experiment Stations. See Colored Plate of CEREALS for illustration of Zea Mays.

MAIZE BEER. See Beer.

MAIZE OIL. See Maize.

MAIZEROY, mä'z'-rwä', René, Baron (1856 —). A French romancer who wrote under the nom de plume Maizeroy, a name of a branch of his family, though his own was Toussaint. He was born at Metz, was educated at the College of Saint Clément, the Toulouse Lyceum, and the Saint Cyr military school, whence he entered an infantry regiment as sub-lieutenant in 1877, but resigned in three years to take up literature as a profession. He began with military subjects, *Souvenirs d'un Saint-Cyrien* (1880); *Le capitaine Bric-à-Brac* (1880); *Au régiment* (1885); *Amours de garnison* (1886); *La vie de soldat* (1887); *Souvenirs d'un officier* (1888); and *Billets de logement* (1888). After a course of journalistic writing for the *Gaulois, Figaro, Gil Blas, La Vie Moderne,* and *Clairon,* he wrote many romances, such as the series entitled *Les amours défendues* (1884), another called *Les Parisiennes* (1883-90), and a third, *La grande bleue* (1888), which contains sea studies. His sketches of Parisian life include *Les malchanceux* (1880); *Le mal d'aimer* (1882); *Celles qui osent!* (1883); *Petites femmes* (1885); *La fin de Paris* (1886); *Lalie Spring* (1887); and *Des baisers du sang* (1898), and he also wrote plays such as *Le miroir* (1892) and *Papa la Vertu* (1899).

MAJESTY. See Titles of Honor.

MAJOL'ICA, *It. pron.* må-yŏ'lê-kå, or **MAIOLICA** (It., variant of *Maiorca,* Sp. *Mallorca,* Majorca, whence the first specimens of the ware were brought). The highly decorated faïence (q.v.) of the Northern Italian towns between 1500 and about 1620; as well as some South Italian wares of later date, the most important of which is that of Castelli in the Abruzzi. The most brilliant pieces of majolica are of the seventeenth century, and their special merit is found in the decorative character of the painting. The forms of the vessels are often refined, as in the jars painted with the names of medicaments and intended for the dispensary of the great monastery or of the ducal palace; as well as for certain vases and platters of more purely decorative character. The greater number of pieces are plates and dishes, often deep, and many of these have peculiar forms, as when a deep, almost hemispherical bowl is surrounded by a broad, flat marly, the whole upper side being painted in one design. The forms, however, are not more graceful nor do they involve more elaboration of design than in other far inferior wares; the painting, on the other hand, is altogether unique in the history of decorative art. The rival potters and painters of the manufactories at Faenza, Urbino, Castel-Durante (Urbania), and Gubbio, in the ancient Duchy of Urbino, Cafaggiolo, on the road between Florence and Bologna, and Deruta, near Perugia, vied with one another in the use of that admirable system of decoration which in the sixteenth century prevailed throughout Italy. In this way, while the forms were kept simple and on the whole severe, the painting grew more and more splendid in pigments and also nobler in composition, both in line and in color.

The decorations are of many types; thus in one large round dish, the whole surface will be covered minutely with scrollwork of that kind most commonly called arabesque, though having no Oriental character whatever, the scrolls themselves, and the animal and human forms mingled with them, being derived from ancient Roman examples and akin to those used by the painters of the school of Raphael in Rome. Another dish of about the same size may have but a single portrait head, perhaps of a lady, filling the whole disk, the colors being those of nature as nearly as obtainable, and a scroll with some laudatory or amatory motto forming a part of the background, between the convolutions of which a grave neutral color is worked in. Other similar plates or dishes have biblical or historical scenes treated freely and with reference in many cases to important mural paintings of the time. Again, others have the human figure nude, or nearly nude, studied from drawings or prints by artists of the same epoch, notably certain engravings of Marcantonio Raimondi, after designs by Raphael.

The introduction, about 1520, of lustre-colors in imitation of the Hispano-Moresco wares added greatly to the brilliancy of the effect. The greatest master in such lustre-painting was Giorgio Andreoli, commonly called Maestro Giorgio, who seems to have possessed the secret of the ruby lustre, which died with him. His work is generally identified with the manufacture at Gubbio and the finest pieces are dated from 1519 to 1530.

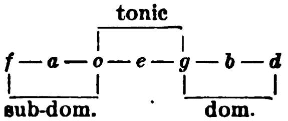
These splendid wares have been copied in modern times, especially in Italy, and with some success; but they have always obtained very high prices. Fine ancient pieces bring from one thousand to ten thousand dollars for a single piece, the rate being governed mainly by the complex character of the design and the brilliancy of color.

The term majolica is used by modern manufacturers for glazed hard pottery intended for use in decorative architecture for garden seats and outdoor work generally. This ware is not often of much artistic merit. The forms are inferior and the colors are limited to those which will bear the greatest heat of the furnace, and which are therefore very resistant to external influences. In fact, for this purpose stoneware with glazes especially prepared for it is found to be a better material. See Stoneware. Consult: Darcel, *Recueil des faïences italiennes* (Paris, 1869); Drury and Fortnum, *A Descriptive Catalogue of the Maiolica, etc., in the South Kensington Museum* (London, 1873); Beckwith, *Majolica and Fayence, Italian, Sicilian, Majorcan, Hispano-Moresque, and Persian* (New York, 1877); Meuer, *Italienische Majolikafliessen* (Berlin, 1880); Malajola, *Memorie storiche sulle maioliche di Faenza* (Bologna, 1880); Argnani, *Le ceramiche e maioliche faentine* (Faenza, 1889); Molinier, *La céramique italienne au quatorzième siècle* (Paris, 1899); and the authorities referred to under Faïence. Very beautiful single examples are given in chromolithography in Labarte, *Histoire des arts industriels* (2d ed., Paris, 1872-75), and in the Spitzer Collection, edition in six folio volumes (Paris, 1890-92). See Stoneware.

MAJOR (Lat., greater). A name applied to the predicate of a logical conclusion. When this, which is known as the major term, is combined with the connecting or middle term, it forms the major premise of a syllogism (q.v.).

MAJOR (Lat. *major,* greater). The rank next above a captain, and below a lieutenant-colonel. In the United States the command appropriate to the grade is: Infantry, a battalion; cavalry, a squadron; artillery, two or more batteries. See FIELD OFFICER; RANK AND COMMAND.

MAJOR. A term in music, applied to intervals and modes. (1) All intervals which are not perfect are distinguished as major or minor. The former contains always one semistep more than the latter: c—e (5 semisteps) is a *major* third, c—e♭ (4 semisteps) a *minor* third. (2) The major mode is the one which is founded upon the major scale. This scale contains the major third and two semisteps between the 3 and 4 and 7 and 8. Thus: c, d, e, f, g, a, b, c. Modern music conceives a mode as a system of three fundamental chords which contain all the tones properly belonging to the scale of that mode. These chords are the tonic, dominant, and subdominant. In the major mode all these chords are major, i.e. they have the major third. The major scale, as represented by its fundamental chords, presents itself then in this form:



See MINOR.

MAJOR, CHARLES (1856—). A lawyer and popular novelist, born at Indianapolis, Ind. He was educated in the common schools of Shelbyville and Indianapolis, studied law and practiced it at Shelbyville, his home. He first became known by a novel *When Knighthood was in Flower* (1898), which was followed by sympathetic sketches of boy life in Indiana, *The Bears of Blue River* (1901) and by a very romantic novel, *Dorothy Vernon of Haddon Hall* (1902).

MAJOR, mä'yōr, GEORG (1502-74). A Lutheran theologian. He was born at Nuremberg, April 25, 1502, and studied theology at Wittenberg under Luther and Melanchthon; was rector at Magdeburg and Eisleben; professor of theology and Court-preacher at Wittenberg in 1536; represented the Protestants in colloquy at Ratisbon in 1546. When the Schmalkald War broke out he left Wittenberg, and was appointed superintendent and Court-preacher at Merseburg (1547), but at the close of the war he returned to Wittenberg. In 1551 he actively supported the doctrine of the Leipzig Interim, that good works were necessary to salvation, in opposition to the strict Lutherans, who denied that proposition. Amsdorf assailed him, declaring that good works were or might be detrimental to salvation. In consequence of the controversy Major removed to Wittenberg, and he died there, November 28, 1574. Toward the close of his life he became involved in the Crypto-Calvinistic controversy. (See CRYPTO-CALVINISTS.) A portion of his works, comprising homilies and commentaries on the Gospels and Pauline Epistles, was published in 1569.

MA'JOR, or **MAIR,** mâr, JOHN (1459-1550). A Scotch historian and scholar. He was born at Gleghornie, East Lothian; studied at Cambridge and Paris, and spent his life teaching alternately at Paris and in his native country, and preparing books for the press. While liberal in his tendencies, he held fast to scholasticism and was opposed to ecclesiastical or theological changes. He published many books, all in Latin, upon varied subjects, and is best known to-day by his *History of Greater Britain, both England and Scotland* (1521), which was the first attempt to write Scottish history in a critical spirit. Consult the translation prepared by the Scottish History Society (Edinburgh, 1892), which contains a life and bibliography.

MAJOR, RICHARD HENRY (1818-91). An English geographer, born in London, October 3, 1818. In 1844 he was appointed assistant in charge of the maps and charts of the British Museum, and in 1867 he became keeper of the maps and plans. From 1849 to 1858 he was honorary secretary of the Hakluyt Society, for which he edited, with translation, *Select Letters of Christopher Columbus* (1847), *Early Voyages to Australia* (1859), and several other valuable works. He was also honored as vice-president of the Royal Geographical Society. For his *Life of Prince Henry of Portugal* (1868), the *Bibliography of the First Letter of Columbus*, and other publications on the early Portuguese and Italian discoveries, he was decorated by the rulers of Portugal, Brazil, and Italy. He died at Kensington, June 25, 1891.

MAJORANO, mä'yō-rä'nō, GAETANO. See CAFFARELLI.

MAJOR'CA (Sp. **MALLORCA,** mä-lyōr'kä). The largest of the Balearic Isles (q.v.). It lies 105 miles southeast of the mouth of the Ebro, the nearest point of the Spanish coast, and in the middle of the Balearic group, with Minorca on the northeast and the Pityusæ on the southwest (Map: Spain, G 3). Area, 1332 square miles. The coasts are nearly all rocky, rising on the northwestern side into steep, rough, and arid mountains, reaching a height of 4768 feet in Mount Torella. The southern coast is lower and indented with bays, that of Palma affording a good harbor. The whole southern half of the island is finely diversified with hills and plains, which are fertile. There are extensive vineyards. The climate is healthful. The inhabitants, who resemble the Catalans in their appearance and manners, are hospitable and industrious, and mostly engaged in agricultural pursuits. The chief products of the island are marble, slate, plaster, the common cereals, oranges, silk, lemons, oil, wine of excellent quality, olives, and aromatic herbs. The population of the island in 1887 was 249,008; and in 1900, 251,920. The capital is Palma (q.v.), situated on the southern coast and connected by a railway with La Puebla and Manacor in the interior.

MA'JOR DO'MUS, or MAYOR OF THE PALACE. Originally the title of a royal steward under the Merovingian line of Frankish kings. His proper function was the care of the royal household; but by 650 the entire administration of the government had passed into the hands of the mayors of the palace. Grimoald of Austrasia and Ebroin of Burgundy exercised an absolute authority in their office as mayors. Under King Dagobert II. of Austrasia and his immediate successors the office of the mayor of the palace was held by Pepin of Herstal, who after the battle of Testry, in 687, became ruler of Neustria also. Pepin was the founder of the Carolingian dynasty. (See Carolingians.) Both he and his son Charles Martel, who died in 741, were kings in everything but name. The latter, who won his surname Martel (the Hammer) by his victory over the Saracens at Tours in 732, was able to bequeath the kingly power to his successor, Pepin the Short. The latter, weary of the anomalous state of things, with the approval of the Pope, became king in name as well as in fact about 751. The last of the Merovingians was deposed and ended his life in a monastery. Consult: Sergeant, *The Franks* (New York, 1898); Brunner, *Deutsche Rechtsgeschichte* (2 vols., Leipzig, 1887-92).

MAJOR-GENERAL. In the United States Army, the rank next above that of brigadier-general, and below that of lieutenant-general. The command appropriate to his grade is four regiments, or in time of peace a department. In war he would command a division or a corps. See Rank and Command.

MAJORITY (ML. *majoritas*, from Lat. *major*, greater). The period when the legal disabilities and peculiar advantages and privileges incident to infancy cease. A person upon attaining his majority has a last opportunity to disaffirm and avoid legal transactions to which he was a party during the period of his minority, and which were voidable because of his disability. Certain privileges of citizenship, such as voting and holding office, usually commence at this time. See Age; Infant; and consult the authorities there referred to.

MAJOR PROPHETS. A name used of the prophets Isaiah, Jeremiah, Ezekiel, and Daniel and of the books of the Old Testament written by them, from the length of their writings. The other prophets of the Old Testament are grouped under the title of minor prophets (q.v.).

MAJU'BA HILL. A height of the Drakensberg, the northwest point of Natal, South Africa, a few miles northwest of Newcastle. It was the scene of the British defeat by the Transvaal Boers on February 27, 1881. The British had occupied the height which commanded the Boers' position at Laing's Nek after a night march and climb of eight hours. They were resting in fancied security, when toward noon the Boers, who, on realizing the situation, had climbed the hill unperceived, rushed the British camp. In the fight that ensued, 92 British soldiers, including the commander, Gen. Sir G. P. Colley, were killed, and about 150 wounded and taken prisoners. The loss of the Boers in killed and wounded was about 130.

MAKALLAH, mȧ-käl′lȧ, or **MACULLA.** A seaport on the south coast of Arabia, 300 miles northeast of Aden (Map: Turkey in Asia (Arabia), R 13). It has a well-protected harbor, and is much frequented by vessels for the purpose of laying in stores. Next to Aden it is the chief port on the southern coast. Population about 18,000, chiefly Arabs and Abyssinians.

MA-KA-RA, mä′ kä′ rä′. Another name for the Egyptian princess Hatasu (q.v.).

MAKART, mä′kȧrt, Hans (1840-84). An Austrian painter. He was born at Salzburg, May 28, 1840, and went to Vienna in 1858 to study at the Academy, but, dissatisfied with the prevailing methods, he returned after a few months to his native city. Through the munificence of the Prince-Archbishop von Tarnoczy, he was enabled to study at Munich, at first under the landscape painter Schiffmann, and from 1861 to 1865 under Piloty. He visited London and Paris in 1863, and soon after went to Rome with a stipend from the Austrian Government. His first work to attract wide attention was the "Plague in Florence," a scene of voluptuous horror, the bold composition of which raised a storm of applause and adverse criticism as intense. In 1869 the Emperor Francis Joseph invited him to settle in Vienna, and caused a sumptuous studio to be fitted up for him. His "Abundantia" pictures (1870, New Pinakothek, Munich), representing the "Fruits of the Earth" and the "Fruits of the Sea," displayed even greater wealth of color than his former pictures. In 1873 followed "Venice Doing Homage to Caterina Cornaro," exhibited in Philadelphia in 1876, and now in the National Gallery, Berlin. The winter of 1875-76, which he spent in Egypt, suggested his "Cleopatra" (1875, Stuttgart Museum), "Antique Hunt on the Nile," and other Egyptian subjects. His most ambitious historical painting, "Entry of Charles V. into Antwerp" (1875-78, Hamburg Gallery), for which he made special studies on a trip to Antwerp and Spain in 1877, was awarded a medal of honor at the Paris Exposition of 1878. This work gave rise to more discussion and moral indignation over the 'glorification of the flesh' than any of his other productions. The last of his larger compositions, "Diana's Hunting Party" (1880, in the Metropolitan Museum, New York), is one of his best works, remarkable for its grand landscape surroundings. His remaining paintings include: "The Five Senses" (1879), and "Triumph of Ariadne" (Vienna Museum); "Summer" (1881, Dresden Gallery), and "Spring" (1884), his last creation.

Makart was appointed professor at the Academy of Vienna in 1879. His health was always delicate, and, as a result of overwork, he succumbed to brain disease, on October 3, 1884. He was preëminently a decorative genius, a brilliant improvisor rather than a well-trained painter, a gorgeous colorist, but weak in draughtsmanship. His sole aim was the cult of sensuous beauty, but his riotous fancy lacked the sustaining power of an intellectual basis; all simplicity and repose are lost in his striving after effectiveness. Yet with all his shortcomings, he was one of the most imaginative artists of modern times. He was the first to bring back the German school to the study and practice of color.

Consult: Lützow, *Hans Makart* (Leipzig, 1886); Stiassny, *Hans Makart und seine bleibende Bedeutung* (ib., 1886); Van Rensselaer, in *Portfolio* (1886).

MAKAW′. A small tribe of expert and daring fishers living about Cape Flattery, at the ocean entrance of Puget Sound, northwestern Washington. They are of Wakashan stock (q.v.), having apparently crossed over from Vancouver Island and conquered a territory for themselves on the southern mainland. In former times they were noted for their fierce and warlike character and still keep up their reputation as being among the most daring boatmen along the coast. The women are skillful basket-makers. Many of the men have beards, which are said to be due to an admixture of white blood from the crew of a

Russian vessel wrecked upon the coast about a century ago. They now number about 360, are gathered upon a small reservation, and are fairly civilized.

MAK'EMIE, Francis (?-1708). The father of American Presbyterianism. He was born near Rathmelton, County Donegal, Ireland; studied at Glasgow; was licensed by the Presbytery of Laggan in 1681, and went the next year as missionary to Barbados. In 1683 he went to Maryland and for several years combined commercial traveling with gospel preaching. In 1690 he was on the eastern shore of Virginia. From 1693 to 1698 he was in Barbados. In 1699 he organized the Presbyterian church of Snow Hill, Maryland, and other churches, and served as their pastor. In 1704 he went to London to appeal to the Presbyterians there for money and men. In this he was successful, and in 1706 the first 'presbytery' met in Philadelphia. It was not a presbytery in the ordinary sense, however; rather 'a meeting of ministers for ministerial exercises,' and not subordinate to synod or assembly. On January 19, 1707, he preached in a private house in New York City, Governor Cornbury having refused him permission to preach in the Dutch church. On January 21 he was arrested at Newtown, L. I., for preaching without the Governor's permission and imprisoned in New York till March 1, and then only released on bail. On June 3 he was tried in New York City and acquitted, because he produced his license to preach, received in Barbados, under the terms of the Toleration Act of William and Mary (1689), which was valid in all parts of the realm. Though acquitted he was condemned to pay costs of both defense and prosecution. He died in 1708 in Accomac County, Va. Consult Briggs, *American Presbyterianism* (New York, 1885); Sprague, *Annals of the American Pulpit*, vol. iii. (New York, 1858).

MAKKARI, mäk'kȧ-rē, Ahmed el (c.1585-1631). A Moorish historian, born in Algeria. He was an active religionist and made two pilgrimages to Jerusalem, six to Mecca, and seven to Medina. Yet he found opportunity for the preparation of several works, of which the most important is the *History of the Mohammedan Dynasties of Spain* (in a partial English translation by Gayangos, 2 vols., 1840-43; edited as *Analects sur l'histoire et la littérature des Arabes d'Espagne*, Leyden, 1855-61).

MAKLAY, mȧ-klī'. See Miklucho-Maclay, Nikolai.

MAKÓ, mō'kō. A town in the County of Csanád, Hungary, situated on the right bank of the Maros, 19 miles by rail east of Szegedin (Map: Hungary, G 3). Its most prominent building is the palace of the Bishop of Csanád. The inhabitants are engaged chiefly in agriculture and stock-raising. There are also a number of oil presses in the town. Population, in 1890, 32,669; in 1900, 33,722. The inhabitants are largely Protestant Magyars.

MAKOLOLO, mä'kō-lō'lō. A branch of the Basutos or eastern Bechuanas of Bantu stock, who migrated northward about the year 1835 and subjugated their kinsmen the Barotse on the middle course of the Zambezi River in British South Central Africa. Livingstone was the first explorer to penetrate their country. Subsequently the Barotse overthrew their conquerors, massacred the men, and distributed the women and children among the tribes. The Makololo speech, however, was forced largely upon the Barotse by this very circumstance. The only political fragment of the once-powerful Makololo owes its preservation to the sending out of an embassy with Livingstone to the east coast to seek a cure for the King's leprosy, previous to the Barotse uprising. This party settled on the Shire River, below the falls, and has grown to be of some importance.

MAKRIZI, mȧ-krē'zē (Ar. Aḥmad ibn 'Alī Taḳī al-Dīn al-Maḳrizī). A Mohammedan historian (c. 1364-1442). His surname, Makrizi, was taken from Makriz, a suburb of Baalbek, where his grandfather had originally lived. Makrizi spent the greater part of his life in Cairo, where he was born. He was taught in Hanafite schools, but joined the Shafiites in 1384. He journeyed to Mecca in 1385, and upon his return was appointed vice-cadi and secretary. He then became successively prefect of police, preacher and teacher at various mosques. In 1408 he was sent to Damascus as curator of a hospital and professor at two different schools. He soon, however, retired to private life, giving himself up entirely to literary pursuits. The years 1430-35 he spent with his family in Mecca. Makrizi is our chief authority for the history and topography of Mohammedan Egypt, though he was not overscrupulous and quietly appropriated the works of other scholars. The most important of his works are: (1) *Al-Mawā'iz wal-i'tibār fi dhikr al-Khiṭaṭ wal-Athār*, a topographical history of Egypt, especially of Fostat and Cairo (ed. Bulak, 1854; French trans. by Bouriant. in the *Mémoires de la mission archéologique Française du Caire*, 1895 seq.); (2) *Al-Sulūk lima'rifat duwal al-Mulūk*, a history of Egypt from 1181 to 1440 (*Histoire des sultans Mamelouks*, trad. par Quatremère, Paris, 1834-44); (3) *Al-Ilmām*, a history of Mohammedan rule in Abyssinia (ed. Rink, Leyden, 1790, and Cairo, 1895); (4) a treatise on Arabic weights and measures (ed. Tychsen, Rostock, 1800); (5) a treatise on Arabic numismatics (ed. Tychsen, Rostock, 1797, and Cairo, 1880; trans. by De Sacy, Paris, 1797).

MALABAR' BLACKWOOD. An East Indian tree. See Dalbergia.

MALABAR COAST. A region on the southwest coast of Madras (q.v.), British India, bordering the Arabian Sea, and popularly defined as extending from Cape Comorin on the south to the River Chandragiri on the north, with the Western Ghats (q.v.) as the eastern boundary (Map: India, B 6). The British district of Malabar forms part of the region. The sandy coast is intersected by numerous inlets of the sea, some of which extend as lagoons for considerable lengths parallel to the coast, receive the various mountain streams, and communicate with the ocean by narrow shallow openings. Considerable inland navigation is carried on by native craft and light-draught coasting vessels. During the western monsoons of the rainy season, the sea obstructs the outlets of these lagoons, and, swollen by the mountain torrents of the Ghats, they form backwaters which overflow the lowlands in all directions. When the waters recede and evaporate during the dry season, the lowlands are cultivated and yield rich crops of rice. The chief towns along the coast are Calicut, the capital of the Malabar district, Mangalore, Tellicherri, Kananur, and Cochin (qq.v.).

MALABÚYOC, mä'lȧ-bōō'yôk. A town of Cebú, Philippines, situated on the Strait of Tañon, on the southwestern coast of the island (Map: Philippine Islands, H 10). Population, in 1896, 13,005.

MALAC'CA. A British territory on the southwest coast of the Malay Peninsula, forming a part of the Straits Settlements (Map: French Indo-China, D 7). Its area is about 650 square miles, and it consists mainly of low, swampy land, rising toward the interior and producing rice, pepper, and sago. There are tin mines in the interior, and tin is the principal export. The population in 1891 was 92,170, of whom 70,000 were Malays, 18,000 Chinese, and only 134 Europeans. The capital is Malacca.

MALACCA. The capital of the Territory of Malacca in the Straits Settlements, situated on the southwest coast of the Malay Peninsula, 125 miles northwest of Singapore (Map: French Indo-China, D 7). It was formerly an important commercial port, but has declined owing to the competition of Singapore. Population, in 1891, 16,502. The town was first taken by the Portuguese in 1511, and was later occupied by the Dutch. It became a British possession in 1824.

MALACCA, Strait of. The body of water which separates the Malay Peninsula on the northeast from the island of Sumatra on the southwest and connects the Bay of Bengal with the South China Sea (Map: French Indo-China, C 6). Its length is 500 miles, and its breadth varies from 50 miles at the southeast to 250 miles at the northwest extremity. Its narrow end is filled with a number of large and small islands, on one of which is the British settlement of Singapore.

MALACCA CANE. A species of cane (*Calamus Scipionum*), used in the manufacture of walking-sticks. It is imported from Sumatra.

MALACCA WEASEL. A civet. See Rasse.

MALACHI, măl'ȧ-kī (Heb., my messenger). Commonly regarded as the name of the author of the last book of the Minor Prophets in the Jewish canon. It is probable, however, that Malachi is neither a proper name nor an appellative of the author of the book, but is used in chap. i. 1 in the literal sense. Hence this passage is to be translated, "The word of Yahweh to Israel by my messenger." This view is borne out by the use of the same word "my messenger" in chap. iii. 1. The prophecy of Malachi is therefore anonymous. The book falls into two divisions: (a) a general presentation of the main theme, followed by a rebuke to the priests (i.-ii. 9), and (b) a rebuke of the people with occasional references again to the sins of the priests (ii. 10-iv. 6). After a brief introduction emphasizing God's love to Israel as proved by history, the prophet addresses the priests, rebuking them for their heartless, mercenary, and corrupt services. He threatens them with judgments if they persist in their sins, and describes the character of a true priest in contrast with their own. The second part consists of a series of oracles, addressed to all the people, who are rebuked for their marriages with the Gentiles and their rejection of the lawful wives of their youth, who were left to weep at the altars of Yahweh. It is maintained by some scholars that this rebuke of unlawful marriages is a simile for the disloyalty of the people toward Yahweh, but the interpretation is forced. The prophet continues by the announcement of the sudden coming of Yahweh, whom the people claimed to seek, but who, in an unexpected coming, would sit in judgment against all transgressors, supplying by His own omniscience swift testimony against them. This represents the prophet's answer to those who declared that God did not concern Himself with the affairs of the individual. He calls the people to repentance, with the promise of abundant blessings to all who obey. To those who already fear God he gives the assurance that they shall always be precious in His sight, and closes with the renewed announcement of the appointed judgment, before which great and dreadful day Elijah, the prophet, will come calling fathers and children to repentance as the only way of avoiding the hastening doom. The Book of Malachi is a production of the Persian period. The Exile lies so far in the past that it is not even referred to. The temple has been rebuilt and the cult is regularly carried on, but the adoption of the Priestly Code has not fulfilled the hopes of its advocates. Mixed marriages were still going on, and the priests used their sacred office for personal aggrandizement. The people, too, were not conscientious in paying their tithes (iii. 8-12). We are therefore transported by this book to the first half of the fourth century B.C., when the evils described, which ultimately led to internal conflicts, terminating in the division of the people into several parties, were beginning to set in. The diction of the Book of Malachi is as pure as in any of the earlier prophetical discourses; and the style is vigorous without approaching in vividness some of its predecessors. The book is referred to no less than four times in the New Testament (Mark i, 2; ix. 11; Luke i, 17; Rom. ix. 13). Consult, besides the general works on the Minor Prophets, especially the commentaries of G. A. Smith, Nowack, and Cullhausen; Köhler, *Der Prophet Maleachi* (Erlangen, 1865); Perowne, "The Book of Malachi," in the *Cambridge Bible for Schools and Colleges* (Cambridge, 1889); Torrey, in the *Journal of Biblical Literature* (1898).

MALACHITE, măl'ȧ-kīt (from Lat. *malache*, Gk. *μαλάχη*, mallow; so called from the color). A basic cupric carbonate that crystallizes in the monoclinic system. It is of a bright green color, and is commonly found massive, though sometimes in botryoidal or stalactitic forms. Malachite occurs with other ores of copper, frequently as a product of their alteration, and is found in the Ural, in Tyrol, at various localities in France, and elsewhere throughout the world. Specimens in fine mass with acicular crystals occur at Bisbee and Morenci, Ariz. It has long been highly prized as a gem stone, especially in Russia, where it is used for inlay work, mantels, table-tops, and paneling.

MALACHY, măl'ȧ-kĭ, Saint (1095-1148). An Irish prelate and reformer. He was born probably in Armagh, of the noble family of O'Morgair, educated by a hermit named Iomhar, and ordained priest in 1119. He made further studies at the famous school of Lismore, but returned to Armagh to throw himself heartily into the movement for the reformation of the Celtic Church. He was chosen Bishop of Down and Connor in 1125. When Celsus, Archbishop of Armagh, was dying, he charged his clergy and people not to elect, according to the prevalent custom, a member of his family, but to choose Malachy. The election was disputed by a kinsman of the late prelate, and it was not till five years later, in 1134, that Malachy was able to enter into undisputed possession of his see, which, however, he resigned in 1137 to return to the smaller diocese. He still retained a great influence over the development of the whole Irish Church. He visited Rome during the pontificate of Innocent II., stopping on his way at Clairvaux, where he made the acquaintance of his future biographer Saint Bernard. The Pope invested him with extraordinary powers as legate in Ireland. Leaving home once more in 1148 to visit Pope Eugenius III. at Clairvaux, he died in the arms of Saint Bernard, was buried there, and canonized in 1189.

A singular document passes under the name of the *Prophecy of Saint Malachy*, which professes to give a list of 141 appropriate mottoes for all the popes from 1143 to the end of time. Saint Bernard, though he ascribes to Malachy the gift of prophecy, mentions nothing like this; and no earlier date for its existence can be authenticated than 1595, in which year it was printed at Venice. As a matter of fact, however, the mottoes for popes later than that date are often singularly appropriate, either to the character, history, or sometimes to the armorial bearings of the various pontiffs. Thus that of Pius VI. was *Peregrinus apostolicus;* Pius VII., *Aquila rapax;* Pius IX., *Crux de cruce*—the cross of Savoy was indeed a heavy cross to him; Leo XIII., *Lumen in cœlo*—the 'light in heaven' has been referred both to the general enlightened policy of his reign and to a blazing comet which appears in chief in his family arms. The few remaining mottoes are: *Ignis ardens; Religio depopulata; Fides intrepida; Pastor angelicus; Pastor et nauta; Flos florum; De medietate lunæ; De labore solis; Gloria olivæ.* "Then," the prophecy concludes, "a second Peter shall sit upon the seven hills, and Christ shall return to judge the world by fire." For further details, consult an article by Lord Bute, "On the Prophecy of Saint Malachy," *Dublin Review* (Dublin, 1885); O'Brien, *Historical and Critical Account of the So-Called Prophecy of Saint Malachy* (Dublin, 1880); and his *Life* by O'Hanlon (ib., 1859).

MAL'ACOL'OGY (from Gk. *μαλακός, malakos,* soft + *-λογία, -logia,* account, from *λέγειν, legein,* to say). The science or study of mollusks as animals, in distinction from 'conchology,' which considers only, or mainly, their shells. See Mollusca.

MALACOPTERYGII, măl'ȧ-kŏp'tẽr-ĭj'ĭ-ī, or **MALACOPTERI** (Neo-Lat. nom. pl., from Gk. *μαλακός, malakos,* soft + *πτερύγιον, pterygion,* diminutive of *πτερόν, pteron,* wing, fin). One of the two primary divisions of osseous fishes in the system of Cuvier, distinguished by soft or spineless fins, the rays of which are jointed. (See Fin.) The cod is an example. The signification has been modified by Müller, Owen, and others, and the term is now little used. Compare Acanthopterygii.

MAL'ACOS'TRACA. See Crustacea.

MALADE IMAGINAIRE, mȧ'lȧd' ē'mȧ'zhē'-nâr', Le (the imaginary invalid). A five-act prose comedy by Molière, produced at the Palais Royal in 1673. It was the last production of the author, who was attacked by a hemorrhage during its fourth performance and died a few moments later. The play is a pitiless satire on the medical systems then prevailing. Agan, through his imagined illnesses, becomes the prey of physicians, and wishes to marry his daughter to the young doctor Drafavius, so that he may be assured of his attendance, but Angélique at last becomes the wife of her lover Cléonte.

MÁLAGA, *Sp. pron.* mä'lȧ-gȧ (ancient *Malaca*). The capital of the Province of Málaga, in the former Kingdom of Granada, Spain. It is situated at the head of a small bay of the Mediterranean Sea, 64 miles northeast of Gibraltar (Map: Spain, C 4). It is picturesquely located on a fertile plain, amid gardens and vineyards, and surrounded on three sides by mountains. The climate is remarkably dry and equable, the place being protected from the north winds by the mountains, and enjoying the tempering influence of the sea breezes. It is a straggling, irregularly built town, with narrow, crooked, and unclean streets, and has few interesting features. The old portion is built at the foot of the steep hill of Gibralfaro, surmounted by a Moorish castle, which is about the only relic of past times still preserved. The newest portions of the town, however, are more attractive. Near the harbor is a handsome, broad promenade, the Alameda, shaded by fine trees and ending at a beautiful fountain. There are several new avenues laid out along the water front, and the new residential district of the Caleta is pretty and well kept. The cathedral is a vast structure of a mixed style of architecture, chiefly Gothic, but very imposing, dominating the whole view of the town from the sea. There is a large bull-ring. The intellectual life is centred in the lyceum of literature and art, with a good library and picture galleries. The harbor, which was formerly obstructed, has since 1892 been improved, and there is considerable trade in sugar, wine, oil, lemons, and other agricultural products. There are manufactures of soap and chemicals, ropes, leather, and cloth, as well as several large iron foundries, sugar refineries, and distilleries. Population, in 1887, 134,016; in 1900, 131,063.

In ancient times Málaga was an important Phœnician, and later a Carthaginian colony. Under the Romans, and especially under the Moors, it developed into a strong military station. It was captured in 1487 by Ferdinand and Isabella, after an heroic resistance.

MAL'AGAS'Y. See Madagascar.

MALAGASY SUBREGION. In zoögeography, a subdivision of the Paleotropical or Ethiopian Region, embracing Madagascar and the Comoro, Seychelle, Mascarene, and neighboring islands. This insular subregion is so different in its fauna from the African continent, and has so much that is exclusive, that some zoölogists have placed it in the first instead of the second rank of zoögeographical divisions. Haeckel, indeed, regarded it, theoretically, as the relic of a former hypothetical continent, or archipelago, Lemuria (q.v.), which extended eastward into the Malayan islands. Its extent was supposed to be indicated by the present distribution of the lemur family, but more recent knowledge in regard to the past distribution of this family, derived from fossil remains, shows that the hypothesis is untenable. This theory indicates, however, the most prominent characteristic of the fauna of Madagascar, which is that it is the headquarters of the lemur tribe. Nearly all the other lemurs known (except the African galago) are Malayan, and this fact, together with various other coincidences, leads to the conclusion that there was once some intercommunication. The isolation of Madagascar must, however, have occurred very long ago, even as time is reckoned in paleontology, for the differences between it and Africa are almost as great as those between it and the Orient. Very deep water separates it from Africa, and there could have been little if any interchange of terrestrial life since a very remote period. Its mammalian fauna is rich in lemurs and insectivores—all small animals of ancient types. The only ungulate is a peculiar species of riverhog, for none of the antelopes and the like of Africa live there. There are very few and small rodents, and none of the great carnivores; the beasts of prey are altogether of the civet family, the largest of which is the ferocious fossa (q.v.), which is about twice the size of a house-cat. In every case the species is peculiar to the island, and in most cases the genus also. Birds are extremely numerous, and on the whole are Ethiopian in character; but many genera and species are wholly restricted to this subregion. Here, too, was the home of many recently extinct birds, such as the epiornis, a relic of an ancient Notogæan tribe, the dodo, solitaire, and so on. (See BIRD, FOSSIL; and EXTINCT ANIMALS.) The reptiles present many purely local forms and curious resemblances to the faunæ of other regions. Of the great colubrine family of snakes, none is of the African type, nor is there a viper; on the contrary, several genera are the same as or similar to those of America. The boas, so characteristic of South America, are represented by Malagasy species, and also the tree-snakes (Dendrophidæ); while several families mainly Oriental are represented here (e.g. see LANGAHA). A similar mixture of types may be found among Malagasy lizards and chelonians—the latter including in the Mascarene Islands the once numerous and very ancient giant tortoises. (See EXTINCT ANIMALS.) No other part of the world seems to have possessed, when first investigated by Europeans, so many senescent species, most of which have succumbed to civilization. The amphibian fauna of Madagascar has only recently been studied and has been found equally remarkable with the rest, so that Gadow makes it one of the four primary subdivisions of the Southern Hemisphere of the Old World (his 'Notogæa'; consult *Amphibia and Reptiles*, London, 1901). There is a mixture of African and Indian forms. The island differs from Africa by the absence of Apoda (limbless batrachians), Aglossa (tongueless frogs), and Bufonidæ (toads). It differs from the Oriental Region in similar absences of certain groups, and has several exclusive forms of its own. Fresh-water fishes and the invertebrate life are not well known, but seem to bear out the former deduction that Madagascar has a fauna which has been very long isolated, and was originally derived from sources which contributed to both Oriental and Ethiopian regions. See DISTRIBUTION OF ANIMALS, and the accompanying maps.

MALAGUETTA (mä'lȧ-gĕt'tȧ) **PEPPER.** See GUINEA PEPPER; GRAINS OF PARADISE.

MALAKANI, mä'lȧ-kä'nē. See MOLOKANI.

MALAKOFF, mä'lȧ-kôf'. See SEBASTOPOL.

MALAKOFF, DUKE OF. The title of Marshal Pélissier (q.v.).

MAL'ALAS (Lat., from Gk. Ἰωάννης ὁ Μαλέλα, or Μαλάλα (*Iōannēs ho Malela or Malala*), John the Orator, from Syr. *malālā*, eloquent, from *malel*, to speak), JOHANNES. A Byzantine chronicler of the sixth century A.D. He was probably of Syrian origin and may have been born in Constantinople. Of his life nothing is known, and his great work, a universal history, is mutilated at beginning and end. It was edited by Humphrey Hody (Oxford, 1691), who completed the preliminary labors of Edmund Chilmead. Hody's edition was revised by Dindorf (Bonn, 1831). Bentley's famous *Epistola ad Joannem Millium*, reprinted in both these editions, deals primarily with Malalas.

MALAMPAYA (mä'läm-pä'yȧ) **BAY,** or SOUND. An inlet of the China Sea, on the northwest coast of the island of Palawan, Philippines. It is one of the first natural harbors in the archipelago. Its narrow entrance can be protected from the rocky headlands on either side, and within is a land-locked harbor, nine miles long by four miles wide, with depths ranging from 36 to 54 feet.

MALAN, mȧ'läN', CÉSAR HENRI ABRAHAM (1787-1864). A Protestant divine. He was born in Geneva, Switzerland; was educated at the Academy in Geneva; ordained to the ministry of the National Church in 1810, and appointed preacher to the cathedral and a regent of the Academy. He preached the Socinian views which prevailed in the Swiss Church at the time, till, in 1816, under the influence of American and Scottish friends, he accepted the Trinitarian doctrine. The promulgation of his new faith exposed him to the censure of the authorities, and he was excluded from the cathedral pulpit in 1818. After preaching in his own house for a time, he became pastor of an independent church called *La Chapelle du Témoignage*, and was for many years a conspicuous figure in the orthodox Protestant life of Central Europe. He founded a theological school at Geneva, and introduced Sunday-schools into Switzerland. He published a book of hymns, *Les chants de Sion* (1826; with original music, 1841); *Les Mômiers, sont-ils invisibles?* (1828); *Le témoignage de Dieu* (1833); *L'église romaine*, which was published in English in New York in 1844; and *Les grains de sénevé* (1846). His *Life* was published by his son, Solomon César Malan, in Geneva in 1869.

MALANAO, mä'lȧ-nou'. A tribe of the Ilano, in southern Mindanao. See PHILIPPINE ISLANDS.

MAL'APROP, MRS. (Fr. *mal-à-propos*, not to the purpose). A character in Sheridan's play *The Rivals* (1775), who has a ludicrous habit of using wrong words which resemble the right ones more or less; as when she speaks of a person as 'a *progeny* of learning,' or of 'an *allegory* on the banks of the Nile.' This species of wit was also employed by Shakespeare in the character of Dogberry (*Much Ado About Nothing*, 1600).

MALAP'TERU'RUS (Neo-Lat. for **malacopterurus*, from Gk. *μαλακός*, *malakos*, soft + *πτερόν*, *pteron*, wing, fin + *οὐρά*, *oura*, tail). A genus of African catfish (q.v.), in which in place of a free dorsal fin there is a soft fatty fin near the tail. Two species are known, viz., *Malapterurus electricus* and *Malapterurus Beninensis*, both remarkable principally for their electric organs and properties. See ELECTRIC FISHES.

MÄLAR, mâ'lär, or **MAELAR**. One of the largest and most beautiful lakes in Sweden, stretching for seventy miles westward from Stockholm, with a breadth of from 2 to 23 miles (Map: Sweden, G 7). Its waters are nearly on a level with the Baltic Sea, into which they are discharged by channels running through and around the city of Stockholm. The lake contains over 1200 islands, and the scenery along its shores is much varied with wood, lawn, and cliffs, and adorned with castles, country-seats, and villas. The surrounding country is fertile and populous, and upon the shores stand the towns of Enköping, Vesterås, Strengnäs, and a number of villages.

MALARIA (from It. *mal' aria*, bad air, from *mala*, fem. sg. of *malo*, from Lat. *malus*, bad, and *aria*, from Lat. *aer*, from Gk. *ἀήρ*, air, from *ἄειν*, *aein*, to blow), and MALARIAL FEVER. This disease was until recent years regarded as a poisonous emanation (whence the name) from the soil of certain localities, but is now definitely known to be one of the specific infectious diseases, and to be caused by an animal parasite peculiar to the blood of man and mosquitoes—the *Plasmodium malariæ*. This parasite, discovered in 1880 by Laveran (q.v.) belongs to a class of protozoa called *hemocytozoa* or *hemosporidia*, which attack and develop in the red blood corpuscles of animals, birds, and fish, and of which numerous species are known. In the human blood several varieties of the parasite have been distinguished, each associated with a definite type of fever. These are the parasites of tertian, quartan, and æstivo-autumnal fever. It was first pointed out by Golgi that the tertian and quartan parasites exist in the blood in great groups, all the members of which are at approximately the same stage of development. An entire group, for example, undergoes sporulation within a few hours' time, and this sporulation is always accompanied by the malarial paroxysm. The tertian parasite requires about forty-eight hours to accomplish its life cycle and produce spores; the quartan about seventy-two hours; so that in a single infection with one or the other of these parasites we observe the characteristic malarial paroxysm on every third and every fourth day, respectively. Double infection, that is, the introduction of two separate groups of parasites at different times, may occur, however, and produce daily paroxysms or attacks on two successive days, with a day's intermission, etc. The exact duration of the life cycle of the æstivo-autumnal type of parasite is less definitely understood. Sporulation may occur at irregular intervals, or may take place continuously, and the resulting fever is correspondingly irregular and sometimes almost continuous. The plasmodium may be observed in the blood of individuals suffering from an attack of malarial fever, moving about in the plasma or attacking and destroying the red blood corpuscles. It begins its life cycle as a small round or oval hyaline amœboid body. The tertian variety is the largest, and is about the size of a red corpuscle ($\frac{1}{3200}$ of an inch in diameter). The æstivo-autumnal variety is less than half that size, the quartan somewhere between the two. The red corpuscles attacked become expanded or shrunken, and decolorized, and the pigment collects in clumps of granules. Later on, long, active processes called *flagellæ* develop from the full-grown parasite, and move about freely in the blood. These are believed to be the sexual elements.

The most brilliant chapter in the history of malaria investigation records the series of experiments by Ross, Manson, and others which proved that the disease was not air-borne, but communicated exclusively by the bites of mosquitoes which serve as intermediary hosts for the parasite, and are the sole agents of infection. Only a particular family of mosquitoes—the *anopheles*—are capable of communicating the disease. Of these three species have been recognized in this country. The *Anopheles quadrimaculatus* is most concerned in the spread of malaria in the United States, and is probably identical with *Anopheles claviger*, the most active agent in Europe. Until the truth of the mosquito theory was established, the only protection against malaria was quinine. Now, however, a much more effective defense is possible for those compelled to live in malarious districts. This consists in shielding themselves from the bites of mosquitoes, especially at night, by the use of nets and screens; in waging a constant warfare upon the insects by draining stagnant pools and marshes where they breed; and in destroying their larvæ by the liberal use of petroleum during the malarial season. See INSECTS, PROPAGATION OF DISEASE BY.

Malaria has a wide geographical distribution. No continent is entirely free from it, and certain parts of the tropics are practically uninhabitable by reason of the severe types of fever which prevail. In Africa the west coast is the worst district. In Asia many portions of India, especially along the valleys of the Ganges and Indus rivers, and parts of China and Persia, are malarious. In Europe the disease prevails in Holland, North Germany, the west coast of Italy, and the far districts of England. In North America it occurs chiefly along the lower Atlantic seacoast and in the Gulf States. The disease is always associated with warm, marshy soils, estuaries, badly drained low-lying districts, and tracts of land rich in vegetation, which offer suitable breeding places for the mosquito.

A typical attack of malaria, or paroxysm, is characterized by three well-defined stages—the *cold* stage is preceded by a headache, yawning, and general malaise; gradually the patient begins to shiver, and in the height of the chill shakes violently. The temperature rises to 102 or even to 105 or 106 degrees. This stage lasts from ten minutes to an hour, and is followed by the hot stage, during which the coldness of the surface disappears and the skin becomes flushed. In from one-half to three or four hours the *sweating* stage sets in. Beads of perspiration appear on the forehead, and the whole body is bathed in a copious sweat. The fever and headache disappear, and within an hour or two the patient sinks into a refreshing sleep and the paroxysm is over.

In the pernicious form of malaria which occurs in the tropics and is always associated with the æstivo-autumnal parasite, the attack is sudden and violent, with intense cerebral disturbance, either delirium or coma. This form is generally fatal. The only remedy which can be relied on in this disease is quinine, which may be regarded as a specific. Large doses have sometimes to be given in the severer types of the affection. For the profound anæmia following long-continued infections, iron and arsenic are given. Consult: Osler, *Practice of Medicine* (New York, 1901); Scheube, *Diseases of Warm Countries* (London, 1903); in the latter book will be found a complete list of articles on recent discoveries in malaria. See Ague; Intermittent Fever; Miasma.

MALASPINA, mä'lå-spē'nå, Saba. An Italian historian, chancellor under Pope John XXI. He was of the same stock as Ricordano Malaspina (c. 1200-81), the author of an *Istoria fiorentina;* and wrote *Res Siculæ*, dealing, from the side of the Guelphs, with the period between 1250 and 1276.

MALATESTA, mä'lå-tĕs'tå. The name of an Italian family settled in the Romagna. The principal branch of the family ruled in Rimini, of which Malatesta de Verrucchio secured possession in 1295. He was an active Guelph partisan, as was his son and successor, Malatestino, who annexed Cesena in 1314. One of his brothers, Giovanni, was the husband of Francesca da Rimini, daughter of Guido da Polenta, the pathetic story of whose love for Giovanni's brother, Paolo, is told in Dante's *Inferno*. Malatestino's brother, Pandolfo I., succeeded him, and continued the traditional policy of his family, in supporting the Pope against the Ghibellines. During the Renaissance the family was among the most powerful in Italy. It was connected by marriage with the houses of Urbino and Montefeltro, and it had possession at one time of Bergamo and Brescia. Perhaps the most celebrated of this family is Gismondo, who died in 1468. He was a patron of artists and authors, the founder of a library at Rimini, and a skillful general, who fought for himself as well as for Venice, Naples, Siena, Florence, and Aragon. He made war upon the Pope and was excommunicated in 1460. He was a son-in-law of Francesco Sforza. The last Malatesta who was Lord of Rimini was Pandolfo IV., who sold Rimini to the Venetians in 1503.

MALATIA, mä'lå-tē'å. The capital of a sanjak and a garrison town in the Vilayet of Mamuret-ül-Aziz, Asiatic Turkey, situated at an altitude of 2900 feet, about 10 miles southwest of the Euphrates and about 90 miles northwest of Diarbekir (Map: Turkey in Asia, H 3). It is a well built town, with many new stone buildings erected since the earthquake of 1893; a fine khan, and extensive bazaars. Fruit culture constitutes the chief industry, and the town is of considerable commercial importance. There are a number of European and American missionary stations. Population, about 30,000, including over 3000 Armenians. During 1895 it was the scene of fearful atrocities, when about 3000 Armenian Christians were massacred. The ancient town of Malatia or Melitene, five miles to the northeast, at Eski-Shehr, now a mass of ruins, was the station of the twelfth legion in the time of Titus and was raised to the rank of a city by Trajan. It was in turn the capital of Armenia Secunda and Armenia Tertia.

MALAUEC, må-lou'ĕk. A language of commerce in Luzon. See Philippine Islands.

MÂLAVIKÂGNIMITRA, mä'lå-vē-käg'nē-mē-trå. A Sanskrit drama of love and intrigue ascribed to Kalidasa. The leading characters are King Agnimitra and Malavika, an attendant of the Queen. In poetical quality the work is much inferior to the Sakuntala. It has been translated into German by Albrecht Weber (1856), into French by Foncaux (1877), and into English by Tawney (1875).

MALAY, må-lā' (Indian, or Eastern), **ARCHIPELAGO.** The largest system of island groups in the world, situated between Southeastern Asia and the Australian continent, separating the Pacific from the Indian Ocean, and extending 20 degrees north of the equator and about half that distance south of it. Exclusive of New Guinea, the archipelago has a total area of about 800,000 square miles, with an estimated population (1895) of 42,000,000. The principal groups are the Sunda Islands, including Sumatra, Java, Bali, Lombok, Sumbawa, Flores, Timor, and the neighboring islands; Borneo and Celebes, with their dependent isles, to the north of the Sundas; the Philippines, northeast of Borneo, and the Moluccas, east of Celebes. The western or Dutch division of New Guinea is also reckoned a part of the Malay Archipelago. The Malay Archipelago is a great seat of volcanic activity. Nearly all of these islands are abundantly watered and covered with luxuriant tropical vegetation. The Portuguese were the first Europeans to engage in trade in the archipelago, but the chief European nations to exploit the islands have been the Dutch and the Spanish, and the archipelago now practically belongs to the former, with the exception of the Philippines (which belong to the United States), the northern part of Borneo (which is British), and the British island of Singapore, and a part of the island of Timor (which is Portuguese). For details, see articles on the separate groups and islands. The name Indonesia is sometimes applied to the Malay Archipelago.

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MALAYALIM, mä'lå-yä'lĭm. Inhabitants of the Malabar coast of Southwestern India, and sometimes called Malabars. They form one of the civilized peoples of Dravidian stock. They have a written language, the alphabet being derived from Hindu sources. The Malayalam language is thought to have been originally an offshoot of Tamil, but ranks now as an independent tongue, with a literature of its own.

Both language and literature, as is the case with all the civilized Dravidian peoples, are being and have been considerably influenced by the modern and old Aryan dialects about them. The Malayalim, who number six or seven millions, have been converted to Hinduism, and a few to Christianity. The first great work in Malayalam is the epic *Ramacharita*, dating from the fourteenth century. A collection of 1000 Malayalam proverbs was published at Mangalore in 1868. Consult: Cust, *A Sketch of the Modern Languages of the East Indies* (London, 1878); Caldwell, *A Comparative Grammar of the Dravidian or South-Indian Family of Languages* (2d ed., London, 1875). See DRAVIDIANS.

MALAYAN PEOPLES. An ethnic term, diversely employed by various authorities. Some, who reject the claims of the Malayan or brown race to rank as a separate division of mankind, on the ground that its Asian or Mongolian affinities are both too recent and too apparent, recognize a 'Malayic stock,' composed of a western or Malayan and an eastern or Polynesian group. (See MALAYO-POLYNESIAN.) By this theory the ancient Malays, presumed to be yellowish-brown in complexion, small-statured and short-skulled, are connected with the Indo-Chinese peoples of continental Asia. Others, who also decline to see in the Malayan race one of the primal human stocks, consider the Malay type distinctly Mongoloid. An 'Oceanic Mongol group' is postulated which includes all the peoples of Malaysia and the islands of the Pacific who are not Negritos, Papuans, or Indonesians (q.v.). The population of Malaysia may be divided into four great ethnic groups, Malays, Indonesians, Negritos, and Papuans, while the archipelagoes of the Indian Ocean and the Pacific were peopled by three distinct races of Malayan linguistic affinities. The Indonesians and Malays do not differ greatly from each other, and the former have been regarded by some as proto-Malays. Certain writers, in view of the fact that dolichocephalic head-forms occur quite commonly among the existing peoples of the East Indies, restrict the term Indonesian to the dolichocephalic variety of man found in this region. They would apply the term Malay or proto-Malay only to the brachycephalic non-Negrito, non-Papuan, and non-Melanesian variety. According to this theory, before the dispersion over this area of the Orang Malayu, or Malays proper, most of the islands of the Malay Archipelago were inhabited by tribes representing various degrees of intermixture of these two races, while, neglecting migrations from the Asiatic continent, the last thousand years have witnessed nothing more than similar mixtures in varying degrees. The reasons for separating the so-called Indonesians from the Malayan or Malayo-Polynesian stock are not, however, convincing, and there is considerable justification for following the suggestion of the linguistic unity of the Malayo-Polynesian peoples and recognizing a somatic kinship of all the aborigines of Malaysia, together with the Malays of the Malay Peninsula and the Malays of Madagascar and the natives of Oceanica, except the Negritos, Papuan-Melanesians, and kindred peoples. Besides their use in this broad sense the terms Malay and Malayan are also employed to designate in particular the 'Malays proper' of the Malay Peninsula, the Menangkabau region of Sumatra, and certain other parts of some of the larger islands, and their representatives scattered in small numbers practically all over the archipelago. There is also probably a considerable Malayan or proto-Mayalan element in certain regions of the coast of Farther India, the Chinese littoral, and Southern Japan. There may also be a large Malayan element in Japan and even in Korea, due to immigration in the wake of the Kuro-Siwo current from the East Indies, by way of the Philippines, Formosa, and Loo-choo. Some writers go so far as to attribute the difference between the Chinese and the Japanese largely to the fact of this Malay cross in the latter.

The Malayan peoples present all varieties of savagery, barbarism, and civilization, from the rude tribes of the interior of some of the islands to the more or less cultivated Malays of the coast, the Javanese, and the civilized peoples of the Philippines. The migration which led to the settlement of the Malays in Madagascar, called Malagasy or Hovas, took place apparently before the spread of Hindu influence in the East Indies, to which was in great measure due the religious and political stimulus that created so many kingdoms in Sumatra, Java, with the adjacent smaller islands, and Borneo, and touched even the Philippine Islands on one hand and New Guinea on the other. There have evidently been several waves of proto-Malay and Malay influence in this area. One of the most notable is that which bore the creed of Islam as far as the Moros of the southern Philippine Islands, and raised it upon the ruins of both the Hindu and the Buddhistic faiths in Sumatra and Java. The influence of India in Sumatra seems to have been less than in Java, where exist the remains of the great temple of Boro Budor and other evidences of Indo-Malay culture. In the little island of Bali a form of Hinduism survives to this day. In parts of Sumatra, Borneo, and Formosa very primitive types of Malayan life and culture are still to be found.

All over the Malayan area the languages of this family show a more or less close kinship with the standard Malay of Menangkabau, which is in many respects the least complicated dialect of the group. The relations of some of the Formosan and Bornean dialects to the Malayan stock are not yet very clear. Some authorities would attribute the affinity of the Polynesian languages with the Malayan to a late spread of Malayan peoples and not to an original separation from a common Malayo-Polynesian source, but the latter view is to be preferred on present evidence. None of the Polynesians proper (except the civilized peoples) possess written alphabets, but among the Malayan peoples a variety of them occur. The Malays proper, like the Philippine Moros, use Arabo-Persian alphabets that came with Islam. Among the civilized peoples of the Philippines, as the Tagals and Visayans, the alphabets in use since the thirteenth century seem to be of Indian origin, and the same statement holds regarding those of certain peoples of Celebes. The Javanese and several of the Sumatran peoples have alphabets of Hindu or Arabic origin. The literary culture of the Malayan peoples is in some sections quite advanced, particularly in Java, where the sacred books are preserved in the Kavi (q.v.) or ancient Javanese language. In Java, too, the puppet-show and the primitive drama are at home. The Macassars of Celebes have also developed their literary instinct to a considerable extent. The literature of the civilized tribes of the Philippines is quite large, several thousand books and pamphlets having been printed in the native dialects. The Malay proper has become a sort of *lingua franca* for the whole Malay Archipelago, and has a literature of its own.

Among the Malayans agriculture varies from the rudest tillage of the savage tribes to the highly developed system of the Battas. It is characteristic of the uneven temperament of the Malayan stock that anthropophagy in a curious form (the eating of criminals) lingered so long among a people otherwise so far above the average as the Battas. Head-hunting, once common among the wilder tribes in large regions of the archipelago, is dying out, even in Borneo and Formosa. Widespread among Malayan peoples is the custom of betel-chewing, the use of the *sumpitan*, or blow-gun, and of the *kris*, or dagger. Pile dwellings (see LAKE DWELLINGS) often occur even on dry land. Of interest to the sociologist are the customs of teknonymy, clan-exogamy, patriarchy, and the co-existence of family and individual property. The utilization of iron by the Malayan peoples is one of the marked features of their native culture.

The Malayan peoples have shown considerable genius in the direction of art and literature, and have produced a number of great men. Some of the native rajas and sultans of Sumatra and Java have been men of much ability. The Tagals, Visayans, Ilocans, and other peoples of the Philippines have produced men of letters and science like Rizal, painters like Luna, statesmen like Mabini, popular leaders like Aguinaldo, and lawyers like Arellano, who would take high rank among any race or people. The Malayans, moreover, are not a decadent or a disappearing race, as the large increases in the population of Java and the Philippines show. Their character has generally been rated rather low by Occidental observers, but the deceit, untrustworthiness, unevenness, treachery, and other bad qualities attributed to them have been much exaggerated and the depth of feeling, honor, and moral and intellectual possibilities correspondingly underestimated.

As to the origin of the Malays, some authorities suppose that they have come from the southeastern part of Asia through the Malay Peninsula, whence they spread over the Indo-Pacific world. According to this theory their first occupation of Sumatra and Java dates from between one and two thousand years before the Christian Era, and the expansion of the Malays could not have been much later than the Aryan conquest of India. Others consider the Malays proper to be of comparatively recent origin, and attribute the diffusion of the Malayo-Polynesian speech to a period long before the dispersion of the Sumatran peoples, who gave their name to the Eastern Archipelago. The best view is that the Malayan stock is either a modified form of a great human race native to this area, or is of continental origin and of Mongoloid affinities, developed in certain directions in its insular habitat. The discovery in 1891 by Dubois of the remains of the *Pithecanthropus erectus* at Trinil in Java (a so-called 'missing link') adds to the interesting problems of the Malayan area. The Malayan stock is of very great value to the ethnologist by reason of the numerous and manifold cultures that have influenced it, as Hindu, Chinese, Arab, Portuguese, Dutch, Spanish, English, American, Japanese, from which have resulted important social, religious, political, and linguistic complications. In the northern part of the archipelago intermixture with a primitive Negrito element, Aëtas (q.v.) of Luzon, has occurred to some extent, while in the east Papuan-Melanesian elements are discernible. Spanish relations with Mexico have caused even some American Indian blood to mingle with that of the natives of part of Mindanao. The Malayans have made their influence felt from Madagascar to Easter Island, and from Japan and Hawaii to New Zealand. Consult: Marsden, *History of Sumatra* (London, 1811); Raffles, *History of Java* (London, 1817); Crawfurd, *History of the Indian Archipelago* (Edinburgh, 1820); Brumund and Von Hoevell, *Altertümer des ostindischen Archipels* (Berlin, 1865); Wallace, *Malay Archipelago* (1895); Bastian, *Indonesien* (Berlin, 1884-94); Groenvelt, *Notes on the Malay Archipelago and Malacca, Compiled from Chinese Sources* (Batavia, 1876); Meyer, *Bilderschriften des ostindischen Archipels und der Südsee* (Leipzig, 1881); id., *Alterthümer des ostindischen Archipels* (Dresden, 1884); Rosenberg, *Der malayische Archipel* (Leipzig, 1878); Forbes, *A Naturalist's Wanderings in the Eastern Archipelago* (London, 1878); Stratz, *Anthropologische Studien aus Insulindie* (Amsterdam, 1890); Steven, *Materialien Zur Kenntniss der wilden Stämme auf der Halbinsel Malakka* (Berlin, 1892); Martin, *Reisen in den Molukken* (Leyden, 1894); Van der Lith and Span, *Encyclopædie van Nederlandsche-Indie* (Gravenhage, 1896); Hagen, *Anthropologischer Atlas ostasiatischer Völker* (Wiesbaden, 1898); Skeat, *Malay Magic* (London, 1900); id., *Fables and Folk-Tales from an Eastern Forest* (Cambridge, 1901). See JAVA, paragraph *Ethnology;* PHILIPPINE ISLANDS; POLYNESIANS; SUMATRA.

MALAYAN SUBREGION. In zoögeography, a faunal district of the Oriental region (q.v.), comprising the Malay Peninsula south of Tenasserim, Sumatra, Java, Borneo, and all the archipelago west and north of Lombok and Celebes, as far as and including the Philippines. It intercalates with the Indian and Chinese subregions along the eastern coast of the Bay of Bengal, and is known in some books as 'Indo-Malayan.' Its southeastern boundary (Wallace's line), at the Straits of Macassar, is curiously distinct from that of the Australian region, although the two are separated only by narrow waters. An explanation of this will be found in the article DISTRIBUTION OF ANIMALS, illustrated by maps. This is almost entirely a region of tropical and forested islands, and its animals are those most typical of the Oriental fauna—that is, organisms suited to uniform but not extreme heat, plenty of moisture, and approximately uniform meteorological conditions throughout the year. One result of this is an interesting similarity between its faunal characteristics and those of equatorial Africa on the one side and of the Amazonian region on the other. The tapirs and trogons of South America, and the African anthropoid apes and hornbills, are curiously paralleled by similar Malayan species absent elsewhere. A noteworthy resemblance also exists between the Malayan and Malagasy regions. Two very conspicuous groups exclusively found in this subregion are the birds of paradise and the orang-utan—the last recalling the fact that Java was the home of Pithecanthropus (q.v.), which, with other considerations, has led many ethnologists to believe that mankind developed its species in this part of the world. See Oriental Region.

MALAYO-POLYNESIAN. An ethnological term, based originally upon linguistic relations, designating the brown or Malayan race, with reference to its western or Malayan and its eastern or Polynesian division. See Malayan Peoples; Polynesians.

MA′LAY PENINSULA, or **MALACCA.** A long, narrow peninsula projecting in a southeasterly direction from the southeastern part of Asia, beginning about latitude 13° 30′ N., and terminating in latitude 1° 22′ N. It is bounded by the China Sea on the east and the Indian Ocean on the west, and is separated from Sumatra by the Straits of Malacca (Map: French Indo-China, D 6). It is about 850 miles long, and its width varies from 45 miles at the Isthmus of Kra to upward of 200 miles at Perak. The peninsula is formed by the southern extension of the mountain ranges that are the water parting between the basins of the Salwin and Menam rivers. The highest elevation is 8000 feet. The granite and sandstone mountain backbone is not continuous, but is broken into several fragments; and the plains, east and west of the mountains, are cut up into areas, large or small, by broad river valleys, in which comparatively small streams carry the drainage to the sea, some of them being navigable for short distances.

The climate is hot and exceedingly unhealthful for foreigners, malaria being a common disease. The health conditions of the towns important in commerce have been much improved by sanitary measures. The port of Malacca, for example, once regarded as the grave of Europeans, is now fairly salubrious. The vegetation is rich and varied, and the forests which still cover nearly the entire peninsula are full of palms, as many as 42 varieties being known to exist. The fauna of the peninsula is not unlike that of Borneo and Sumatra, but it has in addition some species unknown in those islands, as the royal tiger, the elephant, deer, and rhinoceros, of which there are two kinds. The peninsula is very rich in minerals, especially tin, which is mined to a very large extent, the greater part of the world's tin coming from this region. Silver and gold are also found, the export of the latter from the State of Pahang for 1898 amounting to 22,160 ounces. The principal agricultural products are raw sugar, cotton, tobacco, coffee, and tea.

Politically the peninsula is divided between Siam and Great Britain. To the former belong the provinces of Quedah, Patani, Kelantan, Trenganu, and some others, occupying the northeastern and middle portions of the peninsula. The southern half of the rich Province of Tenasserim, Burma, forms the northwestern part of the peninsula. The Straits Settlements, consisting of Singapore, Malacca, and Penang, with the provinces of Wellesley and the Dingdings, constitute a Crown colony of Great Britain, while the Federated Malay States of Perak, Selangor, Negri Sembilan, with its amalgamated States, and Pahang, together with the native State of Johore, are under the protection of Great Britain. The total area of the peninsula is estimated at about 100,000 square miles, with a population of about 1,500,000, consisting for the greater part of Malays and Siamese, with a small number of Negritos, Chinese, and Europeans. The commerce of the peninsula is greatly promoted by the fact that the Straits of Malacca are the gateway between the Far East and the Occident. The vessels of over fifty regular steamship lines are constantly passing through the straits, stopping at Singapore. For details, see articles on Straits Settlements; Singapore; Pahang; Perak; Burma, etc.

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MALAYS. The term applied to a particular group or section of the Malayo-Polynesian race, found in its approximate purity in the peninsula bearing this name, and the Menangkabau region of Sumatra. Soon after their arrival, the Malays proper intermingled to a certain extent with their predecessors. Into the peninsula they brought a relatively high culture. The Malays of the interior are in all respects more fixed in type than those of the coast. With the exception of the degenerate population of the seaports, the Malay gives abundant evidence that he has behind him a somewhat high culture, with which are associated a varied artistic skill and the expressions of a well-developed language and literature. The better part of the Malays, represented by the forest-dwellers, as contrasted with the inhabitants of the towns, are not only men well up in their special crafts, but very companionable, and fond of their homes and families. Their loyalty to their native chiefs, their honesty, and their sense of personal honor are marked. See Malayan Peoples.

MALAY STATES, Federated. See Federated Malay States.

MALBONE, măl-bōn′, Edward Greene (1777-1807). An American portrait painter, born at Newport, R. I. In 1800 he accompanied Washington Allston to Charleston, S. C., and the next year went to Europe. At London he met Benjamin West, president of the Royal Society, who recognized his ability and even urged him to make London his permanent residence. Malbone, however, returned to Charleston, and subsequently practiced his art with success in several American cities, devoting himself particularly to miniatures. His best picture is "The Hours," in which the present, past, and future are represented by female figures. This work, which was bought from the Malbone heirs for $1200, is now in the Providence Athenæum.

MALBROOK, mȧl-brụk′, or **MALBROUGH.** A French satirical song, written about the Duke of Marlborough. It is known also by the words of its first line. The couplets run as follows:

Malbrough s'en va-t-en guerre,
Mironton, mironton, mirontaine;
Malbrough s'en va-t-en guerre,
Ne sait quand reviendra, etc.

The author of the song is unknown, but it was probably written after the battle of Malplaquet (September 11, 1709). It was sung by Marie Antoinette, and it spread from Versailles throughout France. The form of the stanza is similar to that of a lament on the Duke of Guise (1566); but the music cannot be traced back beyond the time of Louis XIV. Beaumarchais incorporated the song in his *Mariage de Figaro* (1784); and Beethoven made use of the melody in his famous *Battle Symphony*. The tune is well known among English-speaking peoples as that to which the words of "We won't go home till morning" are sung.

MALBROUK (Fr. *malbrouk*, *malbrouch*, sort of monkey, probably a corruption of Eng. *Marlborough*). A West African monkey (*Cercopithecus cynosurus*), one of the guenons. It has yellowish grizzled fur and a broad flesh-colored face, with a band across the forehead, the stiff side-whiskers, throat, and under parts white. Little is known of its habits.

MALCOLM, măl′kom. The name of four Kings of Scotland. Malcolm MacDonald succeeded to the throne on the abdication of Constantine II. in 943. The most important event of his reign was the cession of Cumbria about 945 by the English monarch Edmund I. Malcolm was slain about 954 while engaged in quelling a revolt in the north of Scotland.—Malcolm MacKenneth was a grandson of the preceding. He ascended the throne in 1005. His life was passed chiefly in repelling the incursions of the Danes. He died in 1034. A collection of laws, the *Leges Malcolmi MacKenneth*, has been attributed to him, but is obviously a work of a later age.—Malcolm MacDuncan, surnamed Canmore, ascended the throne on the death of Macbeth (q.v.) in 1054, being the son of Duncan whom Macbeth slew. After William of Normandy had seated himself on the English throne, many noble Saxons sought refuge at the Scottish Court, among them being Edgar Atheling, nearest of kin to the Confessor, with his mother, Agatha, and his sisters, Margaret and Christina. Margaret, who was young, beautiful, and pious, captivated the heart of the Scottish King, and a marriage quickly followed. Malcolm's new relations, however, unfortunately, embroiled him with the Normans. In 1070 he crossed the border, harried Northumberland and Yorkshire, but was soon obliged to retreat. William the Conqueror retaliated in 1072, and wasted Scotland as far as the Tay. At Abernethy, Malcolm was compelled to acknowledge him as his liege lord, but (as the Scottish historians hold) only for such parts of his dominions as had belonged to England—viz., Cumbria and the Lothians. War was waged between England and Scotland from 1077 to 1080 and broke out again in 1091, probably at the instigation of the fugitive Anglo-Saxons and the discontented Normans, who had been pouring into Scotland during the iron reign of William, and had obtained large grants of land from the Scottish monarch. Nothing of note, however, happened, and peace was again concluded; but not long after there was a fresh rupture, and in 1093 Malcolm again crossed the border, and laid siege to Alnwick; but while so engaged he was suddenly attacked, defeated, and slain, on November 13, 1093.—Malcolm, surnamed 'The Maiden' (1141-65), was a grandson of David I., and succeeded that monarch in 1153, when only in his twelfth year. He had no sooner mounted the throne than a Celtic insurrection, headed by Somerled, Lord of the Isles, broke out. Some years after, another insurrection broke out among 'the wild Scots of Galloway,' under their chief, Fergus, to crush which Malcolm had to employ a large force. In 1164 he had to put down a second rebellion of Somerled. He died at Jedburgh, of a lingering disease, December 9, 1165. Consult: Skene, *Celtic Scotland* (Edinburgh, 1876-80); Robertson, *Early Kings of Scotland* (Edinburgh, 1862); Freeman, *Norman Conquest* (Oxford, 1867-79).

MALCOLM, Sir George (1818-97). A British general, born at Bombay, India. He entered the army at the age of eighteen, and three years later was taking part in the Afghan War as deputy assistant to the commissary-general. He was promoted to be a lieutenant in 1840, captain in 1849, and lieutenant-colonel in 1854, having served in Baluchistan and throughout the second Sikh War. His next campaign was in Persia (1856-57). He was made colonel (1860) and major-general (1867) for his gallant services during the Indian Mutiny, and after the Abyssinian War of 1868 was knighted, made lieutenant-general (1875), general (1877), and publicly thanked by Parliament. He retired in 1881. His *Remarks on the Indian Army* (1868), published privately, gained importance from the fact of his having commanded Sindh cavalry and Bombay native infantry.

MALCOLM, Sir John (1769-1833). A British colonial administrator and historian. He was born at Burnfoot, Dumfriesshire, Scotland, and at the age of fourteen went to India as a cadet in the Madras army. He distinguished himself at the siege of Seringapatam in 1792, and was appointed to the staff as Persian interpreter. In 1800 he was sent as ambassador to Persia, to form an alliance with that country against Bonaparte, in which he succeeded. In 1802, 1807, and 1809 he was again sent as minister plenipotentiary to the Persian Court. In 1803 he had been appointed Governor of Mysore; and during the two following years his administrative talents were of important service to the Government in reducing to order and tranquillity the newly conquered Mahratta States. In 1812 he returned to England, received the honor of knighthood, and after five years returned to India as the Governor-General's political agent in the Deccan, with the rank of brigadier-general in the Indian army; in the latter capacity he distinguished himself in the wars against the Pindarris and Holkar. In 1827 he was appointed Governor of Bombay, but finally left India in 1830. He died of paralysis at Windsor, May, 1833. Malcolm's writings are: *A History of Persia* (London, 1815; 2d ed. 1828); *Memoir of Central India* (London, 1823); *Political History of India from 1784 to 1823* (London, 1826); and *Life of Lord Clive* (London, 1836), a posthumous work. Consult Kaye, *The Life and Correspond-*

ence of Major-General Sir John Malcolm (3 vols., London, 1856-57).

MALCZEWSKI, mȧl'chĕv'skė̂, ANTONI (1793-1826). A Polish poet, who was born and died at Warsaw. In 1811 he entered the Polish army, and led a gay life in Warsaw, but resigned in 1816, after being seriously wounded in a duel. He went abroad, and in Venice became intimate with Byron, whose *Mazeppa* was directly inspired by Malczewski's vivid account of the story. He returned to Warsaw, then settled in Volhynia, where he wrote *Marja* (1825). He fell in love with the wife of a friend and had to leave for Warsaw, whither she soon followed him, and where they lived in misery. The pictures of the steppes, the portrayals of passion, the characterization of the chief personages of *Marja* are gems. The poem appeared in a German translation by Nitschmann in his *Polnischer Parnass* (4th ed. Leipzig, 1875).

MALDEN, ma̤l'den. A city, including several villages, in Middlesex County, Mass., five miles north of Boston; on the Malden River, and on the Boston and Maine Railroad (Map: Massachusetts, E 3). It has a public library, a city hospital, Home for Aged Persons, and a Young Men's Christian Association building; and there are extensive manufacturing interests. The products include rubber boots and shoes, cotton goods, fibre goods, wire cord, sand and emery paper, leather, and boot and shoe lasts. Malden spends annually in maintenance and operation, over $600,000, the principal items of expense being about $155,000 for schools, $45,000 for the water-works, $40,000 for charitable institutions, $35,000 for the fire department, $30,000 for the police department, and $30,000 for municipal lighting. The water-works, which supply Malden and the cities of Medford and Melrose, were built in 1869 at a cost of over $1,000,000. These works are now a part of the Metropolitan District water system. Population, in 1890, 23,031; in 1900, 33,664.

Malden formed part of Charlestown until 1649, when it was incorporated as a separate town. Michael Wigglesworth (q.v.) was an early pastor here, where in 1662 he wrote *The Day of Doom*. In 1881 the town was incorporated as a city. Consult Corey, *The History of Malden, Massachusetts* (Malden, 1899).

MALDIVE (măl'dĭv) **ISLANDS**. A chain of low coral islands in the Indian Ocean, about 300 miles southwest of Cape Comorin (Map: India, B 7). It consists of 17 compound atolls, each of which has a number of smaller atolls arranged around a central lagoon, so that the entire number of islets amounts to many hundred, the aggregate area being, however, only about 200 square miles. The elevation above the sea level is in no case more than 20 feet, and generally only 6 feet. The larger and inhabited islands, of which there are about 200, are covered with cocoanut palms and fig, citron, and breadfruit trees; wild fowl and fish are abundant. The climate is very hot, and, owing to the numerous lagoons and swamps, unhealthful. The inhabitants, who number about 30,000, are Singhalese of the Mohammedan faith, and are good sailors, carrying on an active trade with the Malabar coast, to which they export in their own vessels copra, tortoise-shells, and dried bonito-fish. They are governed by a sultan residing at Mali, the largest of the atolls, but are under British protection, and subject to the Governor of Ceylon. They were formerly under the Portuguese and the Dutch flag.

MALDIVE LANGUAGE. The Indian dialect spoken in the Maldive Islands. It is closely related to the Ceylonese (see CEYLON, *Language and Literature*), and represents a younger stage of it. The phonological tendencies already seen in Ceylonese have been carried further in Maldive, and it seems that the latter dialect has been influenced by some non-Indian language, yet its Ceylonese origin is clear. The Maldive alphabet was formerly written from left to right, like the Ceylonese script, on which it seems to have been based. Later the direction was reversed, and to the twenty-four original letters three from the Perso-Arabic alphabet were added. No literature exists as yet, and before the researches of Wilhelm Geiger, who visited the islands for linguistic investigations in 1895-96, the only written specimens of Maldive were the vocabularies of Pyrard (1602-07) and Christopher (1834), as well as a small manuscript dictionary at Copenhagen, and a glossed Persian-Hindustani dictionary in the India Office in London.

MALDON, măl'don. A market-town and river port in Essex, England, a mile below the confluence of the Chelmer and the Blackwater, nine miles east of Chelmsford (Map: England, G 5). It has manufactures of crystallized salt; brick-making, iron-founding, oyster fisheries, and some shipping trade. It has a quaint town or moot hall built in the reign of Henry VI., and a grammar school founded in 1547. The town owns corporate property, water supply, and maintains libraries and baths. It has Roman, Saxon, and Danish remains, and is mentioned in 913 as an encampment of Edward the Elder. It received its first charter from Henry II. and was incorporated in 1553. Population, in 1891, 5397; in 1901, 5600.

MAL'DONA'TUS, or **MALDONADO**, JOHANNES (1533-83). A Jesuit theologian. He was born at Casar de Reyna, Estremadura, Spain, and was educated at Salamanca. There he became professor of theology (1556); in 1562 he became a Jesuit at Rome, and in 1563 was sent to Paris to found a college. He taught with such success that jealousy caused charges of heresy against him by the Sorbonne. He was cleared of heresy in 1575, but withdrew to Bourges, and ultimately (1580) to Rome, where he died, January 5, 1583. He is reckoned one of the greatest Roman Catholic exegetes. A list of his books is in De Backer, *Bibliothèque des écrivains de la compagnie de Jésus* (Paris, 1869-76). Most famous of them is his commentary on the Gospels, of which the best edition is by Raich (Mainz, 1874); English translation by Davis (2d ed. London, 1888). For his life, consult the preface to Raich's edition.

MALEBRANCHE, mȧl'bräNsh', NICOLAS (1638-1715). A French philosopher. He was born in Paris, where his father was president of the Chambre des Comptes. He was deformed and sickly, with a constitutional inclination to solitude. His early education was conducted at home. After studying theology at the Sorbonne, he entered the Congregation of the Oratory at the age of twenty-two. His interests were mainly in critical and historical lines, until Descartes's *Traité de l'homme* fell into his hands and gave him an impulse toward philosophy. He spent ten years in the study of the Cartesian system, and published the results in his famous *Recherche de la vérité* (1674; Eng. trans. by T. Taylor, London, 1694). This work, written with perspicuity and elegance, had for its object the psychological investigation of the causes of the errors to which the human mind is liable, as well as of the nature of truth and the way of reaching it. He maintains that we see all things in God; that all beings and thoughts exist in God; and that God is the cause of all changes taking place in bodies and souls, which are therefore merely passive therein. All apparent causation of object by object in the perceived world is only occasional causation. (See OCCASIONALISM.) All physical and psychical changes follow an apparent causal order only because God uses the occurrence of a so-called cause as the occasion on which He calls into being a so-called effect. Only God can cause events to happen; it is an incommunicable divine attribute. His system is a kind of mystic idealism. It was subjected to a thorough examination by Locke and Leibnitz, and opposed by Bossuet and especially by Antoine Arnauld, the Jansenist leader. The attacks made upon it led him to discuss the relations between philosophy and Church doctrine in *Conversations métaphysiques et chrétiennes* (1677), which was followed by a *Traité de la nature et de la grâce*, while he dealt with his chief antagonist expressly in a series of *Réponses de Malebranche à Arnauld*. He died in Paris, where his collected works were published in 1712, and again in 1837 and 1859-71. For his life, consult André, *Vie du R. P. Malebranche* (Paris, 1886); and for his philosophy, Ollé-Laprune, *La philosophie de Malebranche* (ib., 1870-72); Grimm, "Malebranches Erkenntnistheorie und deren Verhältnis zur Erkenntnistheorie des Descartes," in *Zeitschrift für Philosophie und philosophische Kritik* (Berlin, 1877); Blampignon, *Etude sur Malebranche d'après des documents manuscrits* (Paris, 1862).

MALECKI, mȧ-lĕt'skē, ANTONI (1821—). A Polish poet and philologist, born near Posen. He studied in Berlin, and afterwards was instructor of philology at the universities of Cracow and Innsbruck. From 1856 until 1873 he was professor of Polish language and literature at the University of Lemberg. In 1881 he became a member of the Austrian House of Peers. Through his scientific writings he became widely known in Poland, particularly after the publication of his two Polish grammars, *Gramatyka języka polskiego* (1863), and *Gramatyka historyczno-porównawcza* (1879). His ability as a critic is shown in his study of the poet Slowacki, *Juliusz Slowacki, jego życie i dziela* (1866-67). He also wrote *List żelazny* (1854), a drama; *Grochowy wieniec* (1855), a comedy; *Jadwirga* (1860), a tragedy; and translated Sophocles's *Elektra* and *Antigone* (1854).

MALE FERN (*Aspidium filix-mas*). See FERN, MALE; LADY FERN.

MALEIC (mȧ-lē'ĭk) **ACID**. See FUMARIC AND MALEIC ACIDS.

MALEO, MALLEE-BIRD. The mound-bird (q.v.) of Celebes.

MALESHERBES, mȧl'zȧrb', CHRÉTIEN GUILLAUME DE LAMOIGNON DE (1721-94). A distinguished French statesman, born at Paris and educated at the Jesuits' College there. He became counselor to the Parlement of Paris in 1745, and succeeded his father as president of the Court of Aids in 1750. In this office, and as censor of the press, he was an outspoken champion of the liberties of the people, against the monarchy. By him in great measure the publication of the famous *Encyclopédie* was made possible. In 1771 his bold remonstrances against the abuses of law which Louis XV. was perpetrating led to his banishment to one of his estates. Louis XVI., who esteemed him, recalled Malesherbes in 1774. In 1775 he was appointed Minister of the Interior, his friend Turgot being at this time Minister of Finance, but in 1776 he resigned. From this period to the Revolution he passed his time in travel or in the improvement of his estates, with the exception of one year (1787-88) when he was a Minister of State. Malesherbes took no part in the early movements of the Revolution, but in 1792 came forward and obtained permission from the Convention to conduct the defense of Louis XVI. He helped his old master little, and caused his own ruin. Arrested in December, 1793, he was found guilty of treason, and executed with several members of his family in April, 1794. Malesherbes was a member of the French Academy, an able writer on political, legal, and financial questions, and one of the most virtuous and high-minded statesmen of the eighteenth century.

MALET, mȧ'lā', CLAUDE FRANÇOIS DE (1754-1812). A conspirator against Napoleon I. He was born June 28, 1754, at Dôle, in the Department of Jura, and in 1770 joined the King's musketeers. On the outbreak of the Revolution he joined the National Guard, and fought in 1792 on the Rhine. Subsequently he saw service in Italy, attaining the rank of brigadier-general in 1799. From the establishment of the Consulate he came to regard Napoleon's motives with suspicion, and by his open advocacy of republican institutions aroused the ill-will of Napoleon. In 1808 he was charged with conspiracy and thrown into prison, where, in conjunction with other suspects, he busied himself with hatching plans for the overthrow of the Emperor. Napoleon's absence during the Russian expedition seemed to offer the long-awaited opportunity. Malet escaped from prison during the night of October 22-23, 1812, and by spreading a report of Napoleon's death in Russia, succeeded in gaining over two regiments of the National Guard. After liberating two of his comrades in prison, Generals Guidal and Lahorie, he attempted to win over Hullin, commandant of Paris, but failed, and attempting force, was overpowered. The following day Malet, Lahorie, and Guidal were brought before a court-martial and condemned to death, and on October 29th they were executed. Consult Lafon, *Histoire de la conjuration de Malet* (Paris, 1814).

MALET, LUCAS. An English novelist. See HARRISON, MARY SAINT LEGER.

MALFATTI, mȧl-fȧt'tē, GIOVANNI FRANCESCO GIUSEPPE (1731-1807). An Italian mathematician, born at Ala di Trento. His early education was begun at Trento, but at the age of twelve he was sent to Verona, where he entered a college. There he showed such remarkable mathematical ability that he was invited to Bologna at the age of seventeen, where he carried on his studies at the university, coming under the influence of Riccati in mathematics and Bassi in physics. In 1771 he was made professor of higher mathematics at Ferrara, a position which he filled for about thirty years. Malfatti is chiefly known to-day for an interesting problem which he proposed in a memoir published in 1803, and of which he gave the first solution. The problem is as follows: In a triangular prism to inscribe three cylinders of altitude equal to that of the prism and of maximum volume, and so that the remaining volume of the prism shall be a minimum. The problem reduces to the simpler one: To inscribe in a given triangle three circles each tangent to the other two and to two sides of the triangle. The history of the problem has been written several times. Consult Boncompagni, *Bullettino di bibliografia e di storia delle scienze matematiche e fisiche*, vol. ix. (Rome, 1876); also Baker, "The History of Malfatti's Problem," in the *Bulletin of the Philosophical Society of Washington*, vol. ii. (Washington, 1874).

MALFEASANCE (Fr. *malfaisance*, evil-doing, from *malfaisant*, doing evil, from *mal*, from Lat. *malus*, bad + *faisant*, pres. part. of *faire*, from Lat. *facere*, to do). Doing an unlawful act. Often used in contrast with *misfeasance* (q.v.), and with *non-feasance* (q.v.). An agent or servant is always personally liable for malfeasance, although the unlawful act has been commended or ratified by the principal or master. It is often provided by statute that malfeasance in office shall subject the offender to removal from office or position of trust or to criminal prosecution. In such connection the term has been uniformly interpreted as involving the idea of evil-doing, of conscious transgression of legal duty. An administrator or executor, a guardian, a trustee of a private fund, or a director of a corporation, or any person in like position, is guilty of malfeasance when he wrongfully diverts the assets of the estate or the corporation, or when he mingles them with his own funds and uses them for his own purposes. Consult the authorities referred to under CRIMINAL LAW; TORT; TRUST; etc.

MALFORMATION (from Lat. *malus*, bad + *formatio*, formation, from *formare*, to shape, from *forma*, shape). The abnormal process which gives rise to an organ or whole plant whose form is strikingly different from the ordinary; by metonymy, the organ or plant itself, also called a monstrosity. The term malformation is applied most properly to a grotesque form, and particularly to one in which the departure from the normal is apparently unrelated to its function. The term cecidium has been proposed to include galls and malformations, the cause being indicated by prefixes. That branch of biological science which deals with malformations is known as teratology.

The distinction between malformations and variations is wholly arbitrary. Almost all cultivated plants have been brought to their present state of perfection by cumulative selection, the desired variations being fixed by proper breeding until a race has been developed. The organs in these cultivated races, however, differ from those of the wild original oftentimes far more than do those aberrant forms which are called malformations. The one, however, has arisen slowly by gradations; the other has appeared suddenly. Suddenness of origin, therefore, is one of the criteria of malformation. Malformations may be due to any local disturbance of the usual course of growth and development; for instance, local or general disease. Local disease is often produced by the presence of either an animal or a plant parasite, which produces malformations known as galls. Other malformations are due either to the action of external conditions, such as light and moisture, or to causes which, being entirely unknown, are assumed to be internal. Little has as yet been done in the experimental study of malformations, but since plant organs are remarkably plastic, it is scarcely to be doubted that the specific action of external agents will yet be demonstrated. In very few cases, however, can explanation of the origin of malformations be given at present. There is no question that, having once occurred, malformations may be transmitted to the offspring. Horticulturists are familiar with many instances of this. Malformations are known in all groups of plants, especially among the larger ferns and seed plants. Nearly 4000 species in these two groups have produced monstrosities which have been described. Only a few of the more important classes of deviation from the normal can be mentioned.

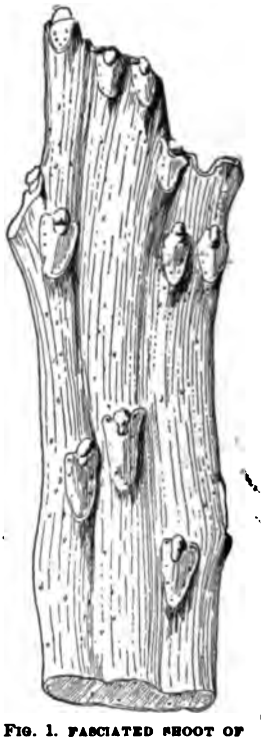


FIG. 1. FASCIATED SHOOT OF AILANTHUS (AFTER BAILEY).

(1) *Suppression.*—For unknown reasons organs may entirely fail to appear, or they may be arrested in a very young state, so that they do not become evident, or they may be dwarfed by stoppage of growth when partially developed. All possible gradations occur between organs of normal size and those that are completely suppressed. (2) *Hypertrophy.*—From equally unknown causes an organ may develop to an extraordinary size without undergoing any noteworthy change in form. It is common to ascribe hypertrophy to an excessive supply of food, but other stimuli must certainly operate. Young shoots of heavily pruned trees, or suckers from the stems, often have all organs immensely enlarged. (3) *Concrescence* is a term applied to the actual union of parts in the course of their development. Such unions are not common, most of the cases of apparent union being explicable in an entirely different fashion. Thus the apparent union of flower parts is due to the growth

of a ring of tissue underneath the developing separate rudiments, carrying these upward on the edge of a growing cup or cylinder. (See FLOWER.) Actual union is due to the adhesion of young surface cells of organs which are closely crowded as they are forming. The union is seldom firm, and slight pressure suffices to separate the adherent parts without real tearing.

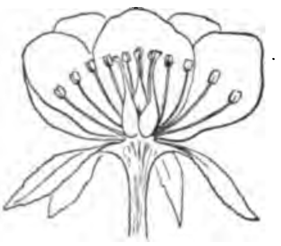


FIG. 2. SOLUTION OF THE FLOWER PARTS.

Longitudinal section of apple blossom. The calyx, petals, and stamens are normally closely united into a mass about the pistils. Here each set is distinct.

(4) *Fasciation.*—Stems, normally cylindrical, sometimes develop in a flattened form, several to many times the ordinary diameter in one direction and not unusually thickened in the other. (Fig. 1.) Not infrequently one edge of this broad stem grows more rapidly than the other, when it becomes curved edgewise, crosier-like. The ridges and grooves on the surface suggest the union of several normal stems. Contrary to appearance, however, such stems are not ordinarily due to congenital union of independent stems, each from a single bud, but are produced by the simultaneous development of several buds in line. Fasciation is very common in rapidly growing stems, which are abundantly supplied with food and water. The young shoots of asparagus, the flower stalks (scapes) of the dandelion, and young shoots from severely pruned trees frequently furnish fine examples. (5) *Solution.*—In most seed plants some of the foliar or floral structures are ordinarily developed in circles or whorls or in a crowded spiral. If nowhere else, this is certain to occur in the flowers. (Fig. 2.) Sometimes the stem develops between the points of attachment of these normally crowded leaves, separating them unusually. Thus it comes that flower leaves are sometimes separated by considerable lengths of stem and the flower loses its characteristic form. Not infrequently at the same time the petals lose their brighter hues and become greenish. (6) *Proliferation* is a continued growth of an axis whose growth is normally finished, or the development of a branch from growing points which ordinarily either are not formed at all or remain dormant.

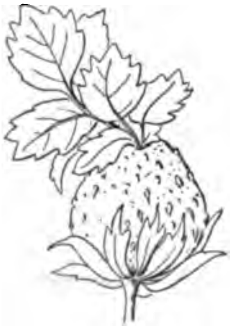
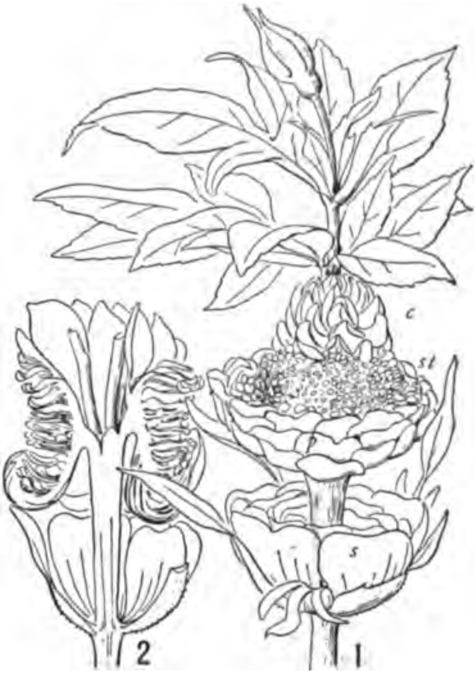


FIG. 3. PROLIFERATION.

Strawberry with axis normally stopped by flower prolonged into a leafy shoot after fruiting.

Thus the formation of a flower usually checks the terminal growth of the axis on which it occurs, but in the pear and apple it not infrequently resumes its growth after the fruit has begun to form and develops a leafy twig beyond it. (Fig. 3.) In a similar way, a flower cluster, such as the head in asters and sunflowers, ordinarily checks the growth of the axis, but occasionally it is prolonged through the cluster, leaving it surrounding the stem. While branches ordinarily occur in the axils of foliage leaves, they do not usually develop in the axils of floral leaves. This may occur, however, and a short branch bearing a complete flower may arise in the axil of each petal or sepal. (Fig. 4.) Some double flowers are made extra-double by this sort of proliferation. A form of proliferation in the flower, when the branches show a tendency to separate readily from the parent, to develop roots, or to become bulb-like and reproduce the plant readily, is called vivipary (q.v.).



2. Longitudinal section. 1. External view.

FIG. 4. PROLIFEROUS ROSE.

The 'hip' is absent; sepals, *s*, leaf-like; petals, *p*, unaffected; above them a circle, *st*, of miniature roses with numerous petals, stamens, etc.; *c*, scales in many rows; above these a whorl of five foliage leaves. The axis is prolonged above the calyx and beyond the scales, carrying foliage leaves and a flower bud.

(7) *Torsion.*—Stems normally straight, or leaves normally flat, may through more extensive growth of one part or another be twisted or crinkled. Lettuce leaves show a crispate form on a large scale (Fig. 6) and twisted stems are extremely common. (8) *Abnormal branching* of leaves is not infrequent. Clover leaves, normally with three leaflets (branches), are often found with four or five, or even as many as seven. The leaves of the dahlia, hickory (Fig. 7), and many other plants shew similar deviations from the normal. Abnormally repeated branching in flower clusters is also common (Fig. 8). (9) *Peloria.*—Irregular flowers, that is, those in which some

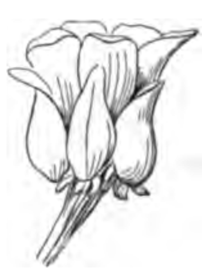


FIG. 5.

Regular peloria of violet, five-spurred sepals replacing the normally single one.

parts are larger or of a different shape from the others, sometimes develop all the parts of like form and size. Thus the yellow-and-orange flower of 'butter-and-eggs' or 'toad-flax' has usually one spurred petal; but not infrequently all five of the petals become spurred, and the flower is then radially symmetrical. (Fig. 5.) A similar but reverse change occurs when flowers which are radially symmetrical become unsymmetrical, as when the tubular ray flowers of the wild chrysanthemum or aster develop ligulate corollas. This is quite as monstrous a form as the opposite, but has not been included among malformations. (10) *Transformation* of floral parts is extremely common. Thus sepals, normally green, may grow into petal-like form and color; while petals may take the shape and function of stamens and pistils. Transformation of this sort, that is, from a less specialized into a more specialized organ, is not so frequent, and the organs are usually very imperfect. Transformation in the other direction, that is, from specialized to less specialized organs, is so common that they are scarcely thought of as malformations. Thus pistils and stamens may develop as petals, a transformation which occurs in most double flowers; petals may be transformed into sepals, or even into imperfect foliage leaves. Indeed, all parts of the flower may be developed as irregular green leaves, of which the so-called 'green roses' are a widely known instance. (11) *Pleimomery,* i.e. increase in the number of any group of organs, occurs most commonly in the floral regions. Some double flowers owe their origin purely to this phenomenon. The increase may affect the number of parts in a whorl, or the number of whorls. In the Bahia or navel orange an additional number of carpels is regularly produced, and an imperfect fruit develops, inclosed by the larger one. The so-called 'two-story apples' have their origin in a similar change. Occasionally the additional carpels are lateral to the others, in which case an imperfect fruit may be developed alongside the more perfect one.

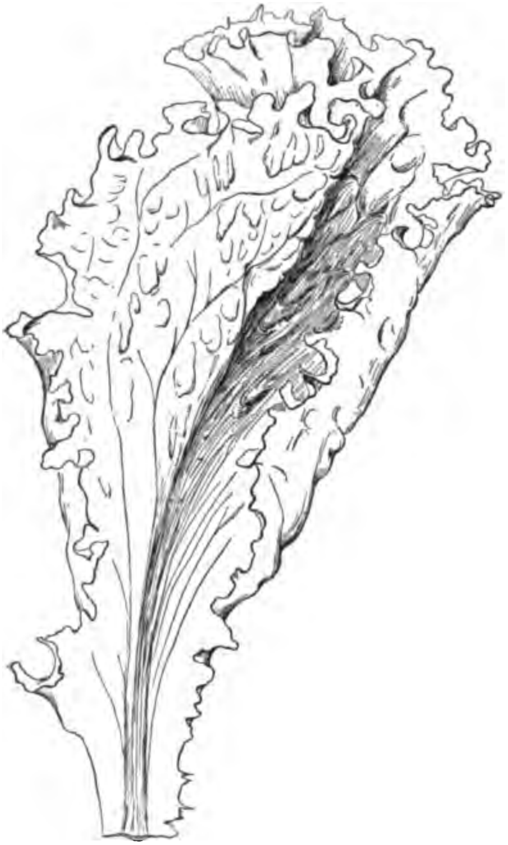


FIG. 6. CRISPATE LEAF OF LETTUCE.

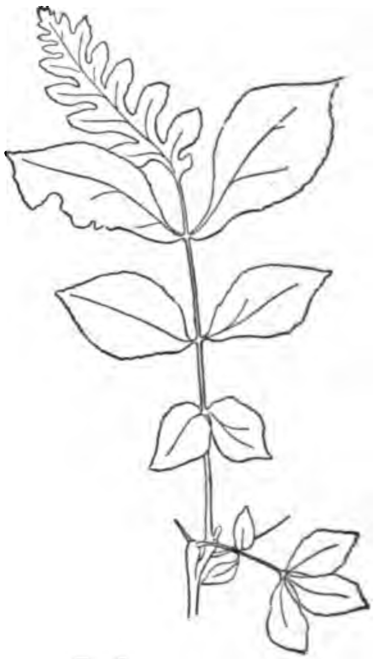


FIG. 7. LEAF OF HICKORY.
Showing abnormally branched terminal leaflet.

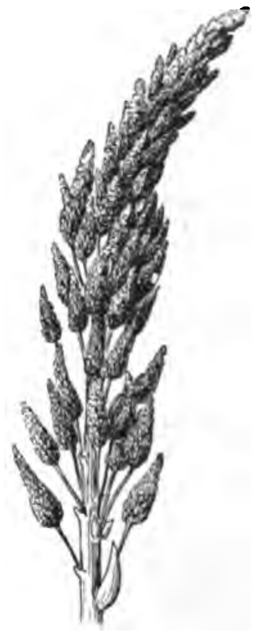


FIG. 8. ABNORMAL BRANCHING.
The flower cluster of plantain abnormally branched; the normal inflorescence is formed of crowded single flowers.

Malformations differ strikingly from galls in the process of their formation, which is due to intrinsic causes, whereas galls result from some extrinsic cause such as the presence in the plant tissues of insects, mites, worms, fungi, slime molds, etc., or from the secretions of these creatures, or from the presence of both organisms and secretions. Like malformations, galls may appear upon the roots, stems, leaves, or flowers, and may present very diverse abnormalities, particularly as to their external form and to the peculiar and special tissues which compose them.

Bibliography. The most important works are the following: Moquin Tandon, *Eléments de tératologie végétale* (Paris, 1841); Masters, *Vegetable Teratology* (London, 1869); Penzig, *Pflanzenteratologie* (Genoa, 1890-94), in which the extensive literature up to its date is cited. See Galls.

MALHERBE, mȧ'lârb', François de (1555-1628). A French poet and critic, born at Caen. Though Malherbe himself wrote very little poetry of any value, he did much to imbue his contemporaries with a critical sense. Malherbe came after the individualism of the Renaissance had spent its originality. Intellectual lassitude found its expression in criticism, and this found its natural voice in Malherbe, who expressed exactly the state of mind of the cultured men of his time, and heralded all that is typical in the literature of the age of Louis XIV., though he was far from typical of its varied genius. With him the temper of mind that prefers order and rule to originality and individuality began to dominate French literature. This temper is represented by Malherbe rather than caused by him. His *Works* (1630), besides translations and correspondence of much historic interest, consist of 125 poems and a *Commentaire sur Desportes.* The only poem that survives in popular memory is the rather frosty *Ode of Consolation* to his friend Du Perrier on the loss of his daughter. Malherbe had a cosmopolitan training in Normandy, Paris, Heidelberg, and Basel, and enjoyed Court patronage through life. It was this that gave authority to his linguistic and rhetorical dicta, which helped essentially to make the French of Paris the standard for France and to give French thinkers the ideal of logical precision and clarity that has since been their enduring characteristic. His exaggeration of the value of correct diction and prosody was at the time a necessary protest against the careless negligence of genius, though his ideas were carried to excess by his critical successors, of whom the chief was Boileau (q.v.). Malherbe, though he loved to be called a tyrant of words, was a student of popular phraseology, even to the language of the markets, and took thence, as he did from his poetic predecessors, whom also he affected to despise, what he found to his purpose. His *Works*, first collected in 1630, were reëdited in 1666, 1757, 1842, and best by Lalanne (5 vols., Paris, 1860-65). These editions contain the *Life* by Racan, Malherbe's contemporary and pupil. Among the more recent studies of Malherbe may be named Brunot, *La doctrine de Malherbe* (Paris, 1891); Allais, *Malherbe et la poésie française* (ib., 1892); Bourienne, *Points obscurs et nouveaux de la vie de Malherbe* (ib., 1895); Duc de Broglie, *Malherbe* (ib., 1897); Gasté, *La jeunesse de Malherbe* (ib., 1890); Arnould, *Anecdotes inédites sur Malherbe* (ib., 1892); Bourienne, *Malherbe* (ib., 1893).

MALI, mä'lê, Christian (1832—). A German painter, born at Broekhuizen, near Utrecht. In his infancy he went with his parents to Württemberg. Here he practiced wood-carving at first, but, after his removal to Munich, in 1857, took up landscape painting. A visit to Italy suggested afterwards architectural subjects, and studies in Düsseldorf and Paris, where he was influenced by the works of Troyon, led him to the production of pictures in which animals formed the prominent feature. Specimens of these various phases are a "View in Verona," and "Bavarian Alpine Pasture," both in the New Pinakothek at Munich; "Shepherd's Morning Greeting," in the Stuttgart Gallery; and "Sheep in an Approaching Storm."

MALIBRAN, mȧ'lê'brän', Maria Felicita (1808-36). A French mezzo-soprano opera singer, born in Paris. She was the daughter of Manuel Garcia (q.v.), the famous Spanish teacher of singing. At the early age of seven she was a pupil of the famous Panseron; at fifteen she became a pupil of her father, and two years later made an extraordinarily successful début in London, after which her father attempted to establish the Italian opera in New York, but without success. There she married M. Malibran, a Frenchman. After her husband's failure in business she returned to the stage, and was received with great enthusiasm in France, England, Germany, and Italy. Her first marriage having been dissolved, she married De Bériot, the famous violinist, in 1836; but in September of that year she died at Manchester, whither she had gone to take part in a musical festival. Malibran was a woman of generous impulses and magnetic personality, which, coupled with a voice of unusual range and flexibility, served to make her one of the most popular and successful prima donnas of modern times. Consult Nathan, *Life of Mme. Maria Malibran de Bériot* (London, 1846).

MALIC (mä'lĭk) **ACID**, $C_4H_6O_5$. An organic substance of which three modifications are theoretically capable of existence. When actually obtained, these three modifications are found to possess the same chemical properties and to differ from one another only in one of their optical properties: viz. the power of rotating the plane of polarized light.

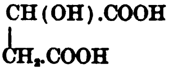
(1) The modification of malic acid that is usually met with is found widely distributed in the plant-world. The name malic is derived from the Latin *malum*, an apple, the acid having been first discovered by Scheele in unripe apples (1785); but the acid occurs also, either in the free state, or combined in the form of salts (*malates*), in gooseberries, currants—in fact, in most acidulous fruits. It may be readily prepared by boiling the expressed juice of unripe mountain-ash berries with milk of lime, and dissolving the precipitated neutral calcium salt in hot nitric acid diluted with water; the acid calcium salt thus produced is decomposed with oxalic acid, the precipitated calcium oxalate removed by filtration, and the filtrated solution of malic acid evaporated to dryness. In this manner malic acid may be obtained in the form of colorless, deliquescent crystals that melt at 100° C. and are readily soluble in water and in alcohol. The solutions have the power of turning the plane of polarized light to the left.

(2) The second modification of malic acid may be obtained by the reduction of ordinary tartaric acid. Its solutions have the power of turning the plane of polarized light to the right.

(3) The third modification of malic acid may be prepared by a variety of chemical methods; it has been obtained from mono-bromo-succinic, fumaric, and malic acids, and from certain other

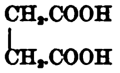
substances. But whatever the way in which it is made, it is found, on examination, to be nothing but an intimate mixture of precisely equal parts of the first two modifications. It is optically inactive because its components turn the plane of polarized light in opposite directions and so neutralize each other's rotatory power. Though very similar in most of its properties to the levo-rotatory modification, it is found to be less soluble in water, to crystallize somewhat more readily, and to form crystals that are not deliquescent. The separation of its components may be effected by the crystallization of their cinchonine salts, which differ from each other considerably in their physical properties.

Chemically, malic acid is a hydroxy-derivative of succinic acid, into which it is readily converted by the action of hydriodic acid at a high temperature. The chemical relationship of malic and succinic acids is shown by their constitutional formulas:



$$\begin{array}{l}CH(OH).COOH \\ | \\ CH_2.COOH\end{array}$$

Malic acid



$$\begin{array}{l}CH_2.COOH \\ | \\ CH_2.COOH\end{array}$$

Succinic acid

According to the theory of stereo-chemistry (q.v.), the existence of three modifications of malic acid is due to the fact that the molecule of the acid contains a carbon atom to which four different atomic groups are linked: viz. H, OH, COOH, and CH_2COOH.

MALICE (OF., Fr. *malice*, from Lat. *malitia*, badness, from *malus*, bad). While malice in the ordinary sense means an evil disposition or state of mind of one person toward another, in law it denotes a particular state of mind which precedes and causes an illegal act. In general, malice in law may be said to be the conscious violation of law to the prejudice of another, or it may be the state of mind involved in the commission of an act without regard to its consequence and without regard to social duty and the rights of others.

It will be seen that malice does not necessarily involve express intent to commit a wrongful act or conscious violation of law, although it may do so, and usually does. Thus, one who deliberately plans to destroy another's property is guilty of malicious injury to property if he carries out his plan; but he would also be guilty of the same offense if there had been no intent or plan to destroy property if he did the act in reckless disregard of the safety of the property. The so-called doctrine of constructive intent applies to malice.

Malice may be either *implied* or *expressed*. Implied malice is that in which the malicious state of mind is presumed from the commission of the act with which the defendant is charged. Thus murder, which is a crime of implied malice, may be proved by proving that the defendant committed the homicide without apparent legal justification. Malice in the civil law of torts is implied malice. Express malice is that which requires to be expressly proved and which is not established by mere proof of the act with which a defendant is charged. Most statutory crimes requiring malice are of this character. Thus in case of malicious injury to property the malice must be expressly proved. This, however, may be, and usually is, accomplished by proving circumstances surrounding or affecting the commission of the act, but not from proof of the act alone.

The common-law crimes of malice are libel, murder, and arson; and there are now numerous statutory malicious crimes, of which malicious mischief and malicious injury to property are common examples. Libel, slander, slander of title, malicious prosecution, false arrest, abuse of process, are all torts involving malice in their commission, but as has been pointed out the malice is presumed from the tortious act. Express malice of a tort-feasor may be the basis for a verdict of the jury awarding punitive or vindictive damages (q.v.). See the articles treating of the subjects mentioned above, and consult the authorities there cited.

MALICIOUS MISCHIEF. In its broadest sense, "any malicious or mischievous physical injury to the rights of another or to those of the public." Whether it was an indictable offense at common law is disputed; but it has long been a purely statutory offense both in England and in the United States. One of the leading English statutes is known as the Black Act, from a statement in the preamble that "several ill-designing and disorderly persons have of late associated themselves under the name of blacks." This and a large number of other statutes were replaced in 1861 by a criminal consolidation act (24 and 25 Vict., c. 97), which, with its amendments, extends the offense of malicious mischief to malicious injuries to most buildings, to fish-ponds, and various other classes of real property, and to almost any species of personal property. In the United States most of the State statutes are as sweeping and detailed in their provisions as those of England. In a few jurisdictions, however, the offense is confined to a limited class of injuries to personal property.

The intent with which the injury is inflicted must be malicious. As a rule, that term is used in this connection in its ordinary sense; that is, actual malice, not technical legal malice, must be shown. Acording to Blackstone, the injury must be done "either out of a spirit of wanton cruelty or black and diabolical revenge." The Supreme Court of Massachusetts has declared that malice, in this connection, is "not sufficiently defined as the willful doing of an act prohibited by law for which the defendant has no lawful excuse, but the jury must be satisfied that the injury was done out of a spirit of cruelty, hostility, or revenge." Moreover, the malice must be entertained against the owner of the property, not against a third person or the property injured. These doctrines are modified in some States, especially where the statutes define the offense to consist in the willful infliction of unlawful injury. Occasionally a statute makes secrecy in doing the harm an essential element of the crime. In all jurisdictions it is a perfect defense that the injury was inflicted in the discharge of official duty, or under an honest though mistaken claim of right. The offense is ordinarily classed as a misdemeanor (q.v.), although, at times, it is declared a felony (q.v.). Consult: Harris, *Principles of the Criminal Law* (London, 1899); Bishop, *Commentaries on the Law of Statutory Crimes* (Chicago, 1901); McClain, *Treatise on the Criminal Law, as Now Administered in the United States* (Chicago, 1897).

MALICIOUS PROSECUTION. The civil wrong or tort (q.v.) of having prosecuted a person unsuccessfully, maliciously, and without probable cause. In a few jurisdictions it has been made a criminal offense by statute. It is the right of every one to set the law in motion for the punishment of criminal offenses or for the enforcement of his individual claims. The courts have ordered that "public policy requires that parties may freely enter court to settle their grievances, and that they may do this without imminent exposure to a suit for damages in case of an adverse decision by judge or jury."

In order to recover, the plaintiff must establish by proof: (1) That the prosecution of which he complains was instituted by the defendant; (2) that it has terminated in plaintiff's favor; (3) that the defendant acted without probable cause; (4) that he acted maliciously; and (5) that plaintiff was damaged by the prosecution. If he fails to establish any of these fundamental facts, he loses his suit.

While it must be shown that the defendant was the one who set the original prosecution afoot, it is not necessary to prove that he attended to it personally. He may have set the law in motion through an agent. Hence a corporation, a joint-stock company, or a partnership, or any principal may be liable for a malicious prosecution in which only an agent figured personally.

The reason for requiring a termination of the original suit in the present plaintiff's favor, before allowing him to sue for malicious prosecution, is that it would not be consistent with the principles on which law is administered for another court, not being a court of appeal, to hold that a wrong decision was made in the original case. To prevent unnecessary litigation, the original defendant must try the issue tendered him in that case, and must then establish the groundlessness of the prosecution. Of course, this strict rule does not apply to a proceeding which, from its nature, does not admit of such a trial—for example, the search of one's house under a warrant for the discovery of stolen property or incriminating evidence. No issue is here tendered for trial. If the search is fruitless and was instituted without probable cause and with malice, an action is maintainable. Where, however, the original defendant has an opportunity to establish the groundlessness of the original proceeding, he is bound to show a legal ending of that proceeding in his favor. Ordinarily, it is not difficult to say when such an ending has been reached. A final decision of the trial court or magistrate upon the merits is of course a legal determination; so, as a rule, is the voluntary abandonment of the original prosecution, without the defendant's request and consent.

If the original proceeding honestly terminated adversely to the defendant, the question of probable cause is settled against him. Even though he obtains a reversal of the judgment, and on a new trial the decision is in his favor, the conclusive effect of the first decision remains. At least such is the prevailing view, unless the original decision was obtained fraudulently; although some courts treat an adverse decision which has been reversed on appeal as *prima facie* evidence only of probable cause. On the other hand, a termination of the original prosecution in the defendant's favor does not prove a want of probable cause for its institution. Whether the original prosecutor set the law in motion without probable cause is a mixed question of law and of fact. The truth of the circumstances alleged to show probable excuse is a question of fact which is to be determined by the jury; but whether, admitting their truth, they amount to probable cause, is a question of law for the court. Frequently the person sued for malicious prosecution proves that the original proceeding was taken upon the advice of counsel. In order to shield himself behind such advice, he must show not only that he consulted reputable and capable counsel, but that the advice was based upon a full and honest disclosure of all the material facts within his knowledge and belief.

Probable cause having been proved, the plaintiff must prove malice and damage. Malice, in this connection, means something more than the intentional doing of a wrongful act without legal excuse. It is not a legal fiction. It involves the idea of a malevolent or sinister purpose; not necessarily spite or hatred against an individual, but at least an improper or evil motive in setting the law in motion. Its existence is a question for the jury, and it may be inferred from a want of probable cause; but the jury is not bound to draw that inference even though the groundlessness of the prosecution is admitted.

Damage may be shown by proving that it was a criminal prosecution, or, it being a civil suit, that it was attended by an arrest of his person or seizure of his property, or scandal to his reputation (as in bankruptcy proceedings or an inquiry into his sanity), and in these cases he need give no evidence of special loss. "Such a prosecution necessarily and manifestly imparts damages." But if it was a civil suit, unattended by any of the incidents above referred to, he must show that it caused him special loss or harm in order to recover. Even though he is able to show this, he will be defeated in England and in many of the States, upon the doctrine that "in contemplation of law the defendant who is unreasonably sued in a civil action is sufficiently indemnified by a judgment in his favor which gives costs against his opponent." This legal fiction is losing favor. Consult Newel, *Malicious Prosecution, False Imprisonment, and Abuse of Process* (1892), and the authorities referred to under TORT, such as Pollock, *Law of Torts* (7th ed., London, 1903).

MALIGNANT CATARRH. An infectious disease of cattle which affects mainly the respiratory and alimentary tracts. It usually occurs in an enzoötic form and seems to persist in certain localities. The period of incubation is about three weeks. The disease ordinarily attacks young, vigorous animals, and begins with a chill followed by high fever. The eyelids become swollen and the tear formation is abundant. The eyes are unusually sensitive to the light. There are thick bloody discharges from the nose and mouth. The mortality from the disease ranges from 50 per cent. to 90 per cent., death occurring in from one to four weeks. There is no good specific treatment for the disease. The treatment should be symptomatic. Infected animals should be isolated and stables disinfected.

MALIGNANT DISEASE. A certain disease or type of disease which tends almost inevitably to a fatal issue. The tumors characterized as malignant are cancer and sarcoma. Some epidemic diseases assume, at certain times and in particular cases, a virulent, rapidly fatal form, and this is called the malignant or fulminant type of the disease. Among such diseases are scarlet, typhoid, and malarial fevers, endocarditis, purpura (qq.v.), and cerebro-spinal meningitis. Other maladies, such as diphtheria and smallpox, have, through advances in medical knowledge, lost much of the severity that earned for them the title malignant. Smallpox has been almost entirely controlled by vaccination, and diphtheria rendered much less dangerous by the discovery of antitoxin; yet malignant cases of both these diseases occasionally occur. Among other diseases which, on account of their severity, have at one time or another been termed malignant are Asiatic cholera, bubonic plague, pernicious anæmia, acute yellow atrophy of the liver ('malignant jaundice'), and anthrax ('malignant pustule').

MALIGNANT PUSTULE, or Anthrax; Wool-Sorters' Disease; Cherbon; Milzbrand. An infectious disease produced by a rod-like bacillus, the *Bacillus anthracis*. It begins with an acute local inflammation. General infection may result. It is a very serious and generally fatal affection. Herbivorous animals are especially susceptible; less so the omnivora, and least of all the carnivora. It may occur in any part of the world. In man, the disease is always acquired from affected animals. Any part or tissue of an animal dead from anthrax is capable of communicating the disease. The dry bacillus can preserve its virulence for many years, and through any substance to which it may become attached the disease may be communicated; even the feet and probosces of flies which have alighted upon the diseased animal (having in its tissues the bacillus) or upon the infected product may carry the disease. Ants and earth-worms carry it from the buried animals to the grass above. Some minute scratch, abrasion or insect-bite may suffice for the inoculation; after this has taken place there comes, in a few hours, itching and uneasiness. A pimple and then a blister follows, surrounded by a brawny induration of the skin; and œdema, with very great swelling of the parts. The inflammation extends along the lymphatics, and the neighboring lymph-glands are swollen and tender. There is often high fever. Sometimes, in the eyelid, and also in the head, hand, and arm, there may be very great œdema, so that gangrene may result. The constitutional symptoms are generally very grave.

The infection may be by way of the digestive tract, from eating the flesh or drinking the milk of diseased animals. There is then intense poisoning. A chill occurs followed by a fever, with vomiting, diarrhœa, and pains in the legs and back. There may then be shortness of breath, cyanosis, great anxiety, and restlessness and convulsions or spasms of the muscles. There may be hemorrhages from the mucous membranes. Malignant pustule may affect many individuals together, making a veritable epidemic. There is no domestic treatment of malignant pustule. A surgeon should at once be summoned. The site of inoculation must be destroyed by cautery or caustic. Injections of carbolic acid under the skin around the point of inoculation may prevent the spread of the infection. Internally, quinine and stimulants are appropriate. See Carbuncle; Anthrax.

MALIGNANTS. A sobriquet applied by the English Parliamentarians, in 1643, to those who adhered to the House of Stuart, and refused to sign the Solemn League and Covenant, for which see Covenants, The.

MALIGNANT TUMOR. See Tumor.

MALIGNITE (named from the Maligne River, Ontario). An igneous rock, in aspect resembling a coarse-grained basalt (q.v.), but composed of about equal quantities of ægerine-augite and biotite, and of orthoclase feldspar and nephelene. Its relationships are closest with theralite and nephelene basalt.

MALÍNAO, mȧ-lē̆′nou. A town of Luzon, Philippines, in the Province of Albay (Map: Philippine Islands, H 6). It is situated on the southwest shore of the Gulf of Lagonoy, 18 miles north of Albay. It exports large quantities of hemp. Population, in 1896, 10,296.

MALINES, mȧ′lēn′. A town of Belgium. See Mechlin.

MALL, mĕl, The. (1) An avenue on the north of Saint James's Park, London, lined with rows of fine trees. (2) An avenue in Central Park, New York, extending from the Terrace and forming with the latter one of the most successful landscape effects of the park.

MALLALIEU, măl′lȧ-lū′, Willard Francis (1828—). A bishop in the Methodist Episcopal Church. He was born in Sutton, Mass., and was graduated at Wesleyan University, in 1857; he entered the ministry in 1858; was pastor of churches at Sutton, Boston, Chelsea, South Boston, and Worcester, Mass.; and was presiding elder of the Boston district, 1882 to 1884. He was a member of the General Conferences of 1872, 1876, 1880, and 1884, and was elected bishop in 1884. His official episcopal residences were New Orleans (1884-92), Buffalo (1892-96), and Boston (1896—). During his residence in New Orleans he did much to promote the interests of New Orleans University and of the Freedman's Aid Society.

MALLARD (OF. *malard*, *malart*, probably from *male*, *masle*, male, from Lat. *masculus*, male, from *mas*, man). A handsome wild duck (*Anas boscas*), found in most parts of the Northern Hemisphere outside of the tropics. It is about two feet long and weighs two or three pounds. The female has dusky and tawny-brown feathers, but the plumage of the male is glossy green on the head, purplish-chestnut on the breast, black on the back, and a finely cross-barred silver gray on the belly. He also has a tuft of curly feathers above the tail. The mallard is the well-known original stock of the common domestic duck, and in its breeding and other habits it closely resembles our barnyard birds. It is rare in New England, and breeds mostly north of the United States, making its nest on the ground in a marsh, and lining it copiously with feathers. See Duck; and Colored Plate with Water-Birds.

MALLARD, mȧ′lär′, François Ernest (1833-94). A French engineer and mineralogist, born at Châteauneuf-sur-Cher. He entered the Ecole Polytechnique in 1851, and two years afterwards passed to the School of Mines, where he was appointed professor of mineralogy. In 1886 he was made an inspector-general with supervision over the departments of the Northeast. Besides a great number of memoirs on scientific subjects, he wrote an important *Traité de cristallographie géométrique et physique* (1879-84); and produced a *Carte géologique du département de la Haute-Vienne.*

MALLARMÉ, mȧ'lär'mȧ', STÉPHANE (1842-98). A symbolistic French poet, born in Paris. He was professor of English in the Lycée Fontanes. More than Paul Verlaine (q.v.), Mallarmé led the Symbolistic School of poetry. In 1876 he aroused attention with *L'après-midi d'un faune*, illustrated by the painter Manet. In 1878 appeared his *Petite mythologie à l'usage des classes et du monde.* In 1880 he published *Les dieux antiques: nouvelle mythologie*, and Beckford's *Vathek*, with a preface; in 1886, a translation of Poe's *Raven;* in 1887, *Poésies.* His rendering of Poe's *Poems* appeared in 1888; *Vers et prose* in 1893. Some readers find beauty in Mallarmé, but to most readers his prose and his verse seem willfully obscure. Almost from the outset his poetic efforts were the talk of literary Paris. Some critics regarded him as an unusual phenomenon and tried to explain him. In 1895 Lanson expressed the widespread opinion that Mallarmé was a poet of very slight value. Gaston Paris benevolently remarked that Mallarmé was worthy of study. By the small set of Décadents and by their admirers he was heralded as a writer of the highest order, but he had few readers, and his notoriety soon began to wane. About Mallarmé cluster a score or so of Symbolists. The best known are Henri de Régnier, Jean Moréas, Emile Verhaeren, Fleming, Gustave Kahn, and finally Maeterlinck (q.v.). Consult Gosse, *Questions at Issue* (New York, 1893).

MALLEABILITY (from *malleable*, Fr. *malléable*, from ML. *malleare*, to beat with a hammer, from Lat. *malleus*, hammer). The property which certain metals possess of being reducible to thin leaves, either by hammering or by lamination between rollers. The order in which the malleable metals exhibit this property is as follows: gold, silver, copper, platinum, palladium, iron, aluminum, tin, zinc, lead, cadmium, nickel, cobalt. Gold far surpasses all the other metals in malleability, being capable of reduction into films not exceeding the 200,000th of an inch in thickness; silver and copper also may be reduced to leaves of great tenuity. Although gold and silver also present the property of *ductility* (q. v.) in the highest degree, there is no constant relation between the two properties; for example, iron, although it may be reduced to extremely thin wire, is not nearly so malleable as gold, silver, or copper.

MALLECO, mȧ-lyā'kō. A province of Chile, bounded by Argentina on the east, the provinces of Cautin on the south, Bio-Bio on the north, and Arauco on the west. Its area is 2857 square miles. It is mountainous in the eastern and western parts and is well wooded. Timber and wheat are the chief products. The province is traversed by two railway lines and had a population of 98,322 in 1895, as against 59,492 in 1885. A considerable portion of the population consists of Araucanian Indians. The capital is Angol (q.v.).

MAL'LERY, GARRICK (1831-94). An American ethnologist and soldier, born at Wilkesbarre, Pa. He graduated at Yale in 1850, and practiced law in Philadelphia until the outbreak of the Civil War, when he enlisted in the Federal Army, in which he rose to the brevet rank of lieutenant-colonel. On the conclusion of peace he took charge of the Signal Service Bureau, but in 1876 received a position in the Bureau of Ethnology. Among his publications are: *The Former and Present Number of Our Indians* (1877); *A Calendar of the Dakota Nation* (1877); *Introduction to the Study of the Sign Language Among the North American Indians* (1880); *Israelite and India: A Parallel in Planes of Culture* (1889); and *Picture Writing of the American Indians* (1893).

MAL'LESON, GEORGE BRUCE (1825-98). An English author, born in London, May 8, 1825. He was educated at Winchester College, and served thirty-five years in India, ten of which were in the army and the rest in Government positions. He was sanitary commissioner to the Government of India (1866-68), comptroller-general of military finances (1869), and the guardian of the Maharajah of Mysore (1869-77). He obtained the rank of colonel in 1873. He died March 1, 1898. Malleson wrote many books, dealing mostly with India, of which the best is *The French in India* (1868), and the longest is *The History of the Indian Mutiny* (1878-80), a continuation of Sir John Kaye's *History of the Sepoy War.* Among his other works are: *Recreations of an Indian Official* (1872); *Final French Struggles in India* (1878); *History of Afghanistan* (1879); *The Founders of the Indian Empire* (1882); biographies of Akbar (1890), Dupleix (1890), Clive (1882), Hastings (1894), Wellesley (1889); *The Refounding of the German Empire* (1893); and *Lakes and Rivers of Austria, Bavaria, and Hungary* (1897),

MAL'LET (originally **MALLOCH**), DAVID (c.1705-65). A Scotch writer and poet, born near Crieff (Perthshire). He studied at Edinburgh University, and afterwards lived principally in London, where for some time he was one of the secretaries of the Prince of Wales. He changed his name to Mallet when he went to live in England. He was at first a friend and admirer of Pope, but to please his patron, Bolingbroke, he attacked Pope's memory in a preface he wrote for Bolingbroke's *Patriot King* (1749). Mallet again sold his pen during the popular indignation against Admiral Byng in 1757. His works include: *William and Margaret* (1724); *The Excursion* (1728); *Verbal Criticism* (1733); *Amyntor and Theodora, or the Hermit* (1747), poems; and some mediocre plays. He also published two volumes of *Poems on Several Occasions* (1743 and 1762). An edition of his works appeared in 1759.

MALLET, JOHN WILLIAM (1832—). An American chemist, son of the physicist Robert Mallet. He was born at Dublin; was educated there at Trinity College, and at Göttingen; and in 1853 came to the United States to become chemist of the Geological Survey of Alabama. He was professor of chemistry in the State University (1856-60), and in the State Medical College until the Civil War. Mallet served on General Rodes's staff and as manager and director of the ordnance laboratories of the Confederate States. After the war he was professor of chemistry at the University of Louisiana until 1868, when he went to the University of Virginia. With his father, he prepared for the

British Association a catalogue of earthquakes (1852-58). His own writings are mostly contributions to chemical journals, especially *Silliman's*, vol. xvii. sqq.

MAL'LOCK, William Hurrell (1849—). An English theological writer on social questions. He was born in Devonshire, and educated at Balliol College, Oxford, where he won the Newdigate prize of 1872 with a poem on *The Isthmus of Suez.* He was intended for a diplomatic career, but devoted himself entirely to literature, spending a considerable part of his life in Southern and Eastern Europe. His writings, even in fiction, have generally been occupied to a large extent with current problems of thought and life. In philosophy he has aimed at showing that modern science can of itself offer no firm basis for ethical theory; under this head comes *Atheism and the Value of Life* (1884); his most powerful book in this class is *Is Life Worth Living?* (1879), a cogent criticism of the Positivist position as set forth by its own advocates. In this book and still more in *Doctrine and Doctrinal Disruption* (1900), he argues for a sure dogmatic foundation for religious belief, and his logic favors the Roman Catholic Church, with which, however, he did not ritually connect himself. In *The New Republic* (1877), under thin disguises, several of the most famous Englishmen of the time appear and discuss numerous interesting problems. Two novels, *A Human Document* (1892) and *The Heart of Life* (1895), are largely occupied with modern aspects of the relations of the sexes, as is to a certain extent *A Romance of the Nineteenth Century* (1881). *The Old Order Changes* is a counterblast to socialism under the form of fiction; and this is the standpoint of various important economic works—*Social Equality* (1882); *Property and Progress*, an answer to Henry George (1884); *Classes and Masses* (1896); and especially *Aristocracy and Evolution* (1898). We may cite also *The New Paul and Virginia* (1878), a satire on modern Positivism; *Tristram Lacy, the Individualist* (1899); and some volumes of verse, including a translation of part of Lucretius in the metre of Omar Khayyam (1900).

MALLOPH'AGA (Neo-Lat. nom. pl., from Gk. *μαλλός*, *mallos*, wool + *φαγεῖν*, *phagein*, to eat). An order of wingless parasitic insects, commonly called 'bird lice' or 'biting lice.' The latter name is preferable, since they occur upon mammals as well as upon birds, and are distinguished from the true lice of the hemipterous family Pediculidæ (see Louse) by possessing biting mouth-parts. They do not suck blood as do the true lice, but feed upon the feathers or hair of the birds or mammals upon which they are found, just as do the bird mites. (See Mite.) The metamorphosis is incomplete; the body is greatly flattened and generally hard; the head is large and flat; the antennæ are short and from three to five jointed; the eyes are simple, and the jaws are usually toothed and pointed. The front legs are short, and are used only in carrying food to the mouth, projecting forward beneath the head when the insect is at rest. The other legs are strong, and the whole body is usually rather hairy. The eggs are elongate-oval, and are fastened singly to the feathers or hairs of the host animal. The young issue by breaking off a circular lid at the free end of the egg. Five species of bird lice, belonging to three distinct genera, have been found upon the common domestic chicken. Nearly all are cosmopolitan species, and have been carried to all parts of the world. *Goniocotes hologaster* is the commonest of these, although *Goniocotes abdominalis* is also very abundant. *Lipeurus opaculus* is a common form found upon pigeons, and *Lipeurus polytrapezius* occurs abundantly upon turkeys. The domestic cat is often infested by *Trichodectes subrostratus*, and the dog by *Trichodectes latus*. The habit which fowls have of scratching in the dust and throwing it over their backs is an indication that they are infested. The best remedy consists in the free use of pyrethrum or Persian insect powder and of kerosene.

Consult: Osborn, *Insects Affecting Domestic Animals* (Department of Agriculture, Washington, 1896); Kellogg, "A List of the Biting Lice taken from Birds and Mammals of North America," in *Proceedings of the United States National Museum* (Washington, 1899).

MALLORCA, mȧ-lyôr'kȧ. One of the Balearic Islands. See Majorca.

MAL'LORY, Stephen Russell (1813-73). A Cabinet officer in the Confederacy. He was born in Trinidad, W. I., and in 1832 was appointed by President Jackson inspector of customs at Key West. About 1839 he was admitted to the bar, subsequently served in the Florida War, and from 1851 to 1861 represented Florida in the United States Senate. In the latter year he was appointed Secretary of the Confederate Navy, then without a ship. After the war he was imprisoned, but in 1866 was released on parole, and practiced law until his death.

MALLOW (AS. *malwe*, *mealwe*, from Lat. *malva*, from Gk. *μαλάχη*, *malachē*, *μολόχη*, *molochē*, mallow, probably from *μαλάσσειν*, *malassein*, to soften, from *μαλακός*, *malakos*, soft, from Heb. *mallūah*, marshmallow from *mālah*, to flow, so called probably from its emollient qualities, or less plausibly, from the softness of the leaves), *Malva.* A genus of plants of the natural order Malvaceæ. The species, which number about 30, are herbs, or more rarely shrubs. The common mallow (*Malva sylvestris*), which is plentiful in most of Europe, and in America on waysides and heaps of rubbish, is a perennial, with rather large bluish-red flowers on erect stalks. The dwarf mallow (*Malva rotundifolia*), now a common weed in America, has smaller whitish or reddish-white flowers. These two plants and other species are mucilaginous and somewhat bitter. The musk mallow (*Malva moschata*), not unfrequent in America, has a faint musk-like smell. The fibre of *Malva crispa* is used in Syria for textile purposes, and the fibres of many species are probably fit for similar use, and for the manufacture of paper. The young leaves of some are said to be occasionally used as boiled vegetables. *Malva Alcea* resembles the musk mallow in general appearance, and is often cultivated. It is a perennial with deep rose-colored flowers often veined with dark red. A number of cultivated plants are often called mallows, but most of them belong to other genera of the mallow family.

MAL'MA. A vernacular name in Kamtchatka, adopted as the specific designation, and sometimes used as the common name, of the 'bull' or Dolly Varden trout (q.v.).

MALMAG. See Tarsier.

MALMAISON, mȧl'mȧ'zôN' (Lat. *mala mansio*, evil dwelling), La. A château near Versailles, France, some 7 miles west of Paris, known as the home of Josephine Beauharnais before her marriage to Napoleon, and after her divorce in 1809. The history of the place may be traced to the thirteenth century, when it obtained its name from its reputation as a resort for outlaws.

MALMESBURY, mämz'bĕr-ĭ. A market-town in Wiltshire, England, 20 miles northwest of Devizes (Map: England, D 5). It is an interesting town, picturesquely built on an eminence almost surrounded by the Lower Avon. A castle existed here in the seventh century, when a monastery was also founded. The celebrated chronicler William of Malmesbury was a monk in the abbey, which afterwards became a cloth factory. The remains of the abbey-church, partly early Norman and partly decorated English, may still be seen. There are several other relics of antiquity in the place. It was the burial place of Athelstan and the birthplace of the philosopher Hobbes. Population, in 1891, 3000; in 1901, 2900. Consult: *Registrum Malmesburiense*, ed. by Brewer and Martin (London, 1879-81); Perkins, *Malmesbury Abbey* (London, 1901).

MALMESBURY, James Harris, first Earl of (1746-1820). An English diplomat, educated at Winchester, Oxford, and Leyden. At the age of twenty-one, through the influence of Lord Shelburne, he was appointed secretary of the embassy at Madrid. His skillful diplomacy there as chargé d'affaires at the time of the dispute between England and Spain in regard to the Falkland Islands led to his appointment in 1771 as Minister Resident at Berlin, where he remained four years. In 1777 he was made Ambassador to Russia. The state of his health compelled him to leave Saint Petersburg in 1783, but next year he accepted from the Pitt Ministry the post of Minister to The Hague. In 1788 he brought about an alliance of England with Holland and Prussia, which service gained for him the title of Baron Malmesbury. Returning to England, he entered Parliament, of which, in spite of his long absences, he had been a member since 1770. He was a Whig till 1793, when he became a supporter of the Administration, and Pitt sent him to negotiate a treaty between England, Prussia, and Holland—a mission which he successfully discharged. In 1794 he arranged the marriage between the Prince of Wales and Caroline, daughter of the Duke of Brunswick. His fruitless negotiations for peace with the French Republic in 1796 at Paris and next year at Lisle were his last missions, as he now deemed himself incapacitated by growing deafness from taking further part in public affairs. In 1800 he was made Earl of Malmesbury and Viscount Fitzharris. Consult: his *Diaries and Correspondence* (4 vols., London, 1845); *Lord Malmesbury and His Friends* (London, 1870), both ed. by J. H. Harris, his grandson; *Lord Malmesbury's Embassy: Official Documents in the Negotiations at Lisle* (Edinburgh, 1797); Auckland, *Journal and Correspondence* (London, 1861-62); Stanhope, *Life of Pitt* (4 vols., London, 1861).

MALMESBURY, James Howard Harris, third Earl of (1807-89). An English statesman. He was educated at Eton and Oxford; was returned to Parliament as a Conservative in 1841, but succeeded his father in the peerage the same year. He became Secretary for Foreign Affairs in Lord Derby's first Administration (1852). Lord Malmesbury occupied the same position in the second Cabinet of Lord Derby (1858-59), when he endeavored to prevent the war between France and Sardinia and Austria. In 1866 he became Lord Keeper of the Privy Seal, remaining in office till 1868. From 1874 to 1876 he was again Privy Seal. He edited the *Diaries and Correspondence* of his grandfather (London, 1845); and *The First Lord Malmesbury and His Friends* (London, 1870). Consult *Memoirs of an Ex-Minister: An Autobiography* (London, 1884; 4th ed. 1885).

MALMESBURY, William of. An English chronicler. See William of Malmesbury.

MALMIGNATTE, măl'mê-nyăt' (corruption of the Corsican name *marmignatto*). A spider of the genus Latrodectus, common in Southern Europe, whose bite is much dreaded. See Spider; and compare Tarantula.

MALMÖ, măl'mẽ. A seaport of Sweden, the capital of the Län of Malmöhus, and the third largest city in the country. It is situated on the Sound, opposite Copenhagen, with which it is connected by ferry (Map: Sweden, E 9). The old part of the city is entirely surrounded by canals, inside of which the old fortifications have been razed, and their sites converted into beautiful parks and boulevards. Among the most prominent buildings are the fine city hall, built in 1546 in the Dutch Renaissance style, the old Gothic Church of Saint Peter, begun in 1319, and the Governor's residence. The Malmöhus, an old fortified castle of the fifteenth century, is now used as a prison. Malmö is an important industrial centre, and has some of the largest iron works and foundries in the country, besides manufactures of railroad and tram cars, textiles, shoes and gloves, tobacco, brandy, and chocolate. It is the terminus of eight railroad lines, and has the largest artificial harbor in Scandinavia, with regular steamship connection with many foreign cities besides Swedish coast towns. Its population has more than trebled since 1860, and in 1901 was 60,857. Malmö is first mentioned in the early part of the twelfth century, when its name was Malmöghe, or Malmhauge, which means 'sandbank.' It was then a fishing village, but by the beginning of the sixteenth century it was, next to Copenhagen, the largest and most important city of the Danish possessions. During the wars of the following period it declined until the opening of its harbor in 1775, when its prosperity began to return. In 1658 it came into the possession of Sweden together with the district of the Skåne.

MALMSTRÖM, mălm'strẽm, Bernhard Elis (1816-65). A Swedish poet and author, born in the Province of Nerike. He studied at the University of Upsala, and afterwards became dean and professor of æsthetics and literature there (1856). His poetical works, though few in number, have placed him among the first of Swedish poets. They include: *Fiskarflickan vid Tynnelsö* (1839) ("The Fisherman's Daughter"); *Angelika*

(1840), an elegy, which won him the prize of the Swedish Academy; *Julianus* (1841); and *Dikter* (1845-47). Among his prose writings are *Litteratur historiska Studier* (1860-61). His complete works were published posthumously, *Samlade Skrifter* (1866-69).

MALMSTRÖM, JOHAN AUGUST (1829-1901). A Swedish painter, born in East Gothland. He studied at the Stockholm Academy for six years, then went to Düsseldorf, and afterwards to Paris, where he became a pupil of Couture. After his return (1867), he was made professor at the Stockholm Academy. His works are mainly historical, taken from national subjects.

MALO, må′lō′, CHARLES ALBERT (1851—). A French military writer, born at Pin-le-Haras in Orne. In 1879 he became editor of the *Journal des Débats*, and in 1885, in conjunction with Berger-Levrault, founded the *Revue de Cavalerie*. His most important works are the summaries or technical descriptions of campaigns that he contributed to Muquardt's *Bibliothèque internationale d'histoire militaire;* among them *Campagne de 1805 en Allemagne et en Italie* (1886); *Campagnes de Gustave-Adolphe* (1887); and *Campagnes de Turenne* (1888).

MALOLOS, må-lō′lôs. The capital of the Province of Bulacán in the island of Luzon, Philippines (Map: Philippine Islands, E 5). It is situated on an arm of the Pampanga Delta, 7 miles north of Manila Bay. It has a telegraph station and lies within a short distance of a station on the Manila Railroad, being a considerable trade centre. It was the first capital of the so-called Philippine Republic, proclaimed by the natives after the Spanish-American War, but was soon abandoned by the insurgent Government. Population, 14,600, almost exclusively Tagálog.

MALON, må′lôɴ′, BENOÎT (1841-93). A French socialist, born near Saint Etienne, in the Department of Loire. Because of his agitation on behalf of the International he had to leave France for some years. He returned in 1880 and later edited the *Revue Socialiste* until his death at Asnières, September 13, 1893. Malon did not think the social question to be as simple as did the German Socialists, and believed that religion, ethics, and æsthetics would bear their part in solving the problems. He was a man of fine character and great influence. He wrote: *L'International, son histoire et ses principes* (1872); *Histoire du socialisme et des prolétaires* (1881-84); *Le socialisme réformiste* (1885); and *Le socialisme intégral* (1890-91).

MALONE, må-lōn′. A village and the county-seat of Franklin County, N. Y., 60 miles east by north of Ogdensburg; on the Salmon River, and on the New York Central and Hudson River and the Central Vermont railroads (Map: New York, F 1). It is the seat of Northern New York Institution for Deaf Mutes, and has Franklin Academy and the school district library with about 6500 volumes. The village controls large agricultural interests, and is an important industrial centre, having tanneries, woolen mills, pulp and paper mills, flour mills, foundries and machine shops, sash, door, and blind factories, etc. The government is administered by a mayor, annually elected, and a village council, chosen on a general ticket. Malone was settled about 1803. Population, in 1890, 4986; in 1900, 5935.

MALONE, EDMOND (1741-1812). An English scholar and editor of Shakespeare, born in Dublin, October 4, 1741; educated at Trinity College, Dublin, and called to the Irish bar (1767). In 1777 he settled in London and began a systematic study of Shakespeare. In 1778 he published his *Attempt to Ascertain the Order in Which the Plays of Shakespeare Were Written.* This work, the first of the kind, was so well done that it has withstood, in the main, the most recent application of verse tests. In 1780 Malone published two important volumes as supplementary to Johnson's edition of Shakespeare as revised by George Steevens. In 1790 appeared his edition of the dramatist in ten volumes. At his death, April 25, 1812, he left material for a new edition, which was prepared by James Boswell, the younger. It appeared in 1821 in 21 volumes, and is known as the Third Variorum. Though not very well arranged in parts, it still remains the best of all complete critical editions. Malone has been called dull; he was also laborious and painstaking. He also edited: *The Critical and Miscellaneous Prose Works of Dryden*, containing a valuable introductory essay (4 vols., 1800); took part in the Chatterton controversy with *Cursory Observations on the Poems Attributed to Thomas Rowley* (1782); and exposed the Ireland forgeries (1796). Consult his *Life*, by James Prior (London, 1864).

MALONE, JOHN (1854—). An American actor and writer, born in Westfield, Mass., but brought up on the Pacific Coast. In 1880 he went upon the stage in San Francisco. He played with Edwin Booth (1886-87), Tommaso Salvini (1889-90), Modjeska (1897), Mrs. Langtry (1888), and Richard Mansfield. Later he devoted himself to the writing of criticism.

MALOO (mä′lo͞o) **CLIMBER.** An East Indian climbing plant. See BAUHINIA.

MALORY, or **MALLORE**, Sir THOMAS (flourished 1470). Author of the *Morte d'Arthur.* Nothing certain about him is known beyond the meagre statements in the preface and the closing passage of his famous book. He was a knight, and his translation was completed in the ninth year of the reign of King Edward the Fourth, i.e. in 1469 or 1470. According to Bale (*Scriptores*, 1548), he was a Welshman; and with Bale agree several recent Celtic scholars, asserting at least that his name is derived from the Welsh *Maelor.* With more probability G. L. Kittredge has identified him with a Warwickshire Thomas Malory, Knight, who died March 14, 1470. Malory placed the manuscript of the *Morte d'Arthur* in the hands of William Caxton, who divided it into books and chapters and printed it in 1485. The contents are briefly summarized in the colophon: "Thus endeth thys noble and joyous book entytled le morte Darthur/ Notwythstondyng it treateth of the byrth/ lyf/ and actes of the sayd kyng Arthur/ of his noble knyghtes of the rounde table/ theyr meruayllous enquestes and aduentures/ th'achyeuyng of the sangreal/ & in thende the dolorous deth & departyng out of thys world of them al." The book was intended as a compendium of the various romances that had attached themselves to the legend of King Arthur. Here are the great stories of Lancelot and Guinevere, of Tristram and Iseult, and of all the knights and ladies as known to the reader of Tennyson's *Idylls of the King*. Caxton expressly states that Malory reduced his book into English out of certain French books. So far as is known, these sources were the prose Merlin, the prose Lancelot and the prose Tristan (thirteenth century), which in turn were expansions of Geoffrey of Monmouth, *History of the British Kings* (Latin prose), and the verse-tales of Chrestien de Troyes and other French romancers (second half of twelfth century). Malory also made use of a fine English poem, known as the *Morte Arthur* (fourteenth century). Malory's compendium is necessarily loose in structure; but the career of King Arthur gives it a certain unity. It enjoys the distinction of being the first notable English prose romance.

The *Morte d'Arthur* was well received from the first. Caxton's edition in black letter was followed by six similar editions down to 1634. The work was not again reprinted till 1816, when two editions appeared. It is now accessible in the editions of Thomas Wright (London, 1856; new ed. 1897); Edward Strachey (modernized in spelling, Globe ed., ib., 1868, often reprinted); John Rhys (ib., 1893); the Temple Classics (ib., 1897); and Sommer (ib., 1889-91). The last, a reprint of the first edition, contains an exhaustive study by Sommer on the sources, and an essay by Andrew Lang on the style. Consult also: *Selections*, edited by Mead (Boston, 1897), and *Inflections and Syntax*, by Baldwin (Boston, 1894); Jusserand, *Le roman au temps de Shakespeare* (Paris, 1888). See ARTHUR; GRAIL, THE HOLY; LANCELOT; MERLIN; TRISTRAM; GEOFFREY OF MONMOUTH.

MALOT, mȧ'lō', HECTOR (1830—). A popular French novelist, born near Rouen. Though educated for the law, he turned to letters, served an apprenticeship on Didot's *Dictionnaire biographique* and the popular *Journal pour Tous*, did some dramatic collaboration of no present significance, and in 1859 produced his first novel, *Victimes d'amour*, a book of more promise than his very first production afterwards allowed him to realize. In some sixty-five volumes he dealt with the society of the Second Empire, showing a tendency to sensationalism, a power of graceful description, and a very winning sympathy for child life that made his *Sans famille* (*No Relations*, 1878, translated and republished in America) a cosmopolitan success. Other noteworthy works are: *Un beau-frère* (1869); *Romain Kalbris* (1869); *Baccara* (1886); *Conscience* (1888); *Justice* (1889); *Complices* (1893).

MALPIGHI, mȧl-pē'gē, MARCELLO (1628-94). A celebrated Italian anatomist, born at Crevalcuore, near Bologna. He studied medicine at Bologna under Massari and Mariano, took his doctor's degree in 1653, and was appointed professor at Bologna by the Senate three years later. Shortly after this he went to Pisa, where, in association with Borelli, he made numerous dissections of animals, and ascertained that the muscle fibres of the heart are of a spiral form. The climate of Pisa proving unfavorable, Malpighi removed to Bologna in 1659, where he remained three years, and became very popular. In 1662 he succeeded Peter Castelli at Messina. In 1691 the new Pope, Innocent XII., called him to Rome as his physician, and three years later he died of apoplexy, at the age of sixty-six.

Malpighi lived at a time when nature began to be studied rather than books. He was an original and profound observer; a man of great industry, acute intelligence, and natural aptitude for research. His investigations covered a wide range of subjects; and many of his conclusions are undisputed at the present day. He is most widely known for his efforts to place human physiology on a true basis, but his discoveries in entomology and botany were no less epoch-making. His *Observationes Anatomicæ* (Bologna, 1661) contained the first published researches into the structure of the lungs with the microscope. *Epistolæ Anatomicæ* (Bologna, 1661-65) record the discovery of the *rete Malpighii*, one of the layers of the skin. His observations on the structure of the viscera and his investigations in embryology and vegetable histology, as well as his determination of the structure of glands, were equally important.

MALPIGHIA, mȧl-pē'gĭ-ȧ. A tropical fruit. See BARBADOS CHERRY.

MALPLAQUET, mȧl'plȧ'kā'. A village in the Department of Nord, France, 21 miles east of Valenciennes, and close to the Belgian frontier, celebrated for the bloody defeat of the French, under Marshal Villars, in the War of the Spanish Succession, by the troops of the Grand Alliance, under Marlborough and Prince Eugene, September 11, 1709. The forces engaged consisted of more than 200,000 men, the Allies having a slight superiority in numbers; and the loss on each side amounted to about 20,000 men. The result of the conflict was the capture of Mons and Douai. See SUCCESSION WARS.

MALPRACTICE. In forensic medicine, bad professional treatment, as of disease, pregnancy, or bodily injury, from reprehensible ignorance, carelessness, or with criminal intent. In offering his services to the public, the doctor or surgeon impliedly contracts that he possesses and will employ reasonable skill and learning, will exercise reasonable care, and exert his best judgment to effect good results. This obligation rests on any person making a pretense of professional knowledge. Failure to do this renders him liable for resultant injuries to the patient, criminally or by way of civil suit, according to the degree of his negligence and fault.

Criminal liability arises from gross negligence or lack of competency. The practitioner is not liable for error of judgment or inadvertent mistake. But where manslaughter is charged, he cannot plead the patient's consent as a defense, only the exercise of due care and skill will protect him. Where the results of a physician's fault are not so serious as to constitute an offense against the public and render him liable criminally, he may still be obliged to make compensation to the patient for the damages resulting from his wrongful acts through an action at law. But a physician is not an insurer, and in the absence of express agreement he does not warrant a cure, nor is the test to be applied to his performance that of the highest order of skill and care obtainable, but that of the average of members of his profession in good standing in similar localities, considering the state of medical science of the time. Thus the requirement in knowledge or skill imposed upon the frontier surgeon is not that of the attending physician of a great city hospital. His responsibility before the law is not fixed by the recognition of the tests of any particular school, homœopathic, allopathic, or empirical. What is reasonable care must be determined by the particular case, though the same degree must be rendered to the poor of the charity hospital as to the millionaire's child. This obligation to use proper diligence, care, and skill includes not only diagnosis and the employment of such obtainable remedies and appliances as discovery and experience have proved most beneficial, but also to the giving of proper instructions to patients and nurses, and to freedom from error in writing.

On undertaking a case the law implies a contract that the physician continue his attendance while treatment is required, unless terminated by discharge by the patient or his withdrawal from the case on proper notice. Where action is brought against him for abandoning a case, the burden of proof of showing his discharge rests with the physician. When he informs a patient that his disease or injury is curable when he knows it to be incurable or is ignorant as to the truth of his representation, and the patient is induced to undergo his treatment thereby, he is liable for an action for deceit. It will also be a defense for a suit on his part to recover his fees. When the patient's condition at the time of treatment is a contributing cause to the results of malpractice, in the recovery of damages he will be held liable only for those actually consequent to his acts. Where a practitioner possesses the required qualification and applies his skill and judgment with ordinary diligence he will not be considered responsible for an honest mistake or error of judgment in diagnosis, where there is reasonable doubt as to the course to be followed. This does not include gross errors or failures to keep within recognized and approved methods.

The acts of the patient may be a contributing cause, and when his negligence has been a proximate factor to the injury, the physician cannot be held liable at law for malpractice. Thus where the patient fails to comply with reasonable and necessary directions, even though such compliance is prevented by reason of his condition, or where, through infancy or insanity, he is incompetent to understand the necessity of the treatment and those in charge refuse to enforce the treatment. There is impressed upon the patient an obligation to exercise prudence in proportion to the seriousness of his condition. In New York a judgment recovered by a physician for fees bars an action for malpractice.

Malpractice by a lawyer is evil practice in a professional capacity and the resort to methods and practices unsanctioned and prohibited by law. Consult the authorities referred to under Tort.

MALSTATT-BURBACH, mäl′stät bo͞or′bäG. A town in the Rhine Province, Prussia, on the Saar, 35 miles northeast of Metz (Map: Germany, B 4). It has extensive iron works and manufactures of Portland cement, machinery, railway carriages, and phosphate. It has considerable trade in coal, ore, and limestone. Population, in 1890, 18,378; in 1900, 31,200. Malstatt-Burbach was made a city in 1875, when Malstatt and Burbach were consolidated.

MALSTRÖM, mȧl-strĕm′ (from Norw. *malstraum*, from *mala*, to grind + *straum*, stream), or Maelstrom. A rapid tidal eddy or current running between Moskö and Moskenäs, two of the Lofoten (q.v.) Islands, lying near the southwestern end of the group (Map: Norway, E 3). It has been made famous by the exaggerated accounts of older writers on Norway. Owing to the great difference in level between high and low tide in the West Fjord, between Lofoten and the mainland, the vast mass of water, which every twelve hours must be moved from the Fjord into the ocean and back again, has to run very swiftly through the narrow channels between the islands, causing in several places dangerous currents. The swiftest of these is the Mosköström, which is rendered still more dangerous by the eddies (*malströmme*) caused by sudden differences in the depth of the channel. When the current flows fastest, between high and low tide, and the wind blows directly against it, the sea for miles around becomes so violently agitated that small vessels cannot live in it. Ordinarily it may be traversed without danger.

MALTA, mạl′tȧ. An island in the Mediterranean Sea, belonging to England, situated in latitude 35° 53′ north and longitude 14° 31′ east, between Tripoli and Sicily (Map: Italy, J 12). It is the principal island of the Maltese group, which includes the neighboring islands of Gozo, Comino, and a few islets, and has a total area of 117 square miles. Malta itself is about 17 miles in length, with an area of 95 square miles. The surface is comparatively low, the highest point not exceeding 845 feet above the sea. The climate is mild and healthful, but the island is exposed during August and September to the hot and moisture-laden *sirocco* blowing from the Sahara. The soil is exceedingly fertile, and produces two and sometimes three crops annually. The inhabitants are mostly engaged in agriculture and cattle-raising; the main products of the island are cotton, potatoes, oranges, figs, honey, and corn. The chief manufactures are cotton, filigree, and lucifer matches. The island contains quarries of marble, alabaster, and building stone. Malta, in spite of its comparatively small size, is very important, owing to its central position on the Mediterranean highway. Besides forming a strongly fortified military station, it is exceedingly well suited to its use as a port of call, having at Valetta (q.v.), the capital, one of the best harbors in the world. In 1900, 3814 vessels, with a tonnage of 3,538,088, entered the port, two-thirds of these being British. There are eight miles of railway on the island. In 1900 there were 145 schools, with 15,669 pupils. Besides primary schools there are a university, a lyceum, and two secondary schools. In accordance with the Constitution adopted in 1888, the island is administered by a Governor appointed by the British Crown and assisted by a council composed of 19 members, 6 official and 13 elected by the people. The revenue for 1900 amounted to £356,758, and the expenditure to £365,943. The population in 1900 was 183,679; there were 10,840 British troops stationed on the island. The people of Malta are mostly of the Mediterranean race. They are industrious and economical and numbers of them may be found in the principal cities about the Mediterranean. The

Maltese language, spoken by about a quarter of a million persons, in and out of the island, has in its vocabulary about 70 per cent. of Semitic words, but the grammatical structure is derived from the Latin. The speech of the ruling class is practically Italian, which is still the official language, although most of the pupils in the schools are now learning English.

Malta is identified with the Hyperion or Ogygia of Homer, where Calypso, the daughter of Atlas, who enslaved Odysseus, dwelt in a grotto. Two grottoes bearing her name are rivals as the traditional haunt of the nymph. Probably as early as the sixteenth century B.C. Malta was colonized by the Phœnicians, of which race there are numerous archæological remains. It had developed considerable commercial importance when about B.C. 736 the Greeks dispossessed the Phœnicians and named the island Melita. The Greeks in turn were displaced by the Carthaginians about B.C. 500 to 480. During the first Punic War, Atilius Regulus, commanding a Roman fleet, ravaged the island, and in B.C. 218, during the Second Punic War, it was surrendered to Titus Sempronius by the Carthaginian commander Hamilcar, and became politically attached to Sicily. There are remains of a theatre, temples, and other buildings erected by the Romans, to whom Malta became well known for its textiles. In A.D. 61 Saint Paul was shipwrecked on the north coast, as mentioned in Acts xxvii. and xxviii.; Saint Paul's Bay, in which on the island of Selmun is a colossal statue of the Apostle, is pointed out as the generally accepted landing place. On the dissolution of the Roman power, Malta was occupied successively by Vandals in 454, by Goths in 464, and again by the Greeks under Belisarius in 533. At their third attempt during the ninth century, with the assistance of the natives who massacred the Byzantine garrison, the Arabs became the masters and fortified the harbor as a station for their corsairs in 870. They were not driven out until 1090 by the Normans under Count Roger, who established a popular form of government which, with certain modifications, lasted for 700 years. Again it became politically attached to Sicily until 1530, when Emperor Charles V. granted it with Gozo and Tripoli in perpetuity to the Knights of the Order of Saint John of Jerusalem, after the Turks had captured their great stronghold at Rhodes. Taking the title of the Knights of Malta, they built immense fortifications and rendered invaluable services to Christendom in checking and chastising the Barbary pirates, and in defending the island against the incessant attacks of the Turks. The most formidable of these was the siege in 1565 by the Sultan Solyman II., when the Knights, commanded by the heroic La Valette, forced the enemy at the end of three months to retire with an immense loss of men. Valetta was then built and the fortifications were increased; a continual war on the Moslems was waged until 1798, when, disorganized by internecine quarrels, the Knights surrendered their fortresses to Bonaparte on his way to Egypt. Three months later, however, the Maltese revolted against the French and, assisted by Neapolitan, Portuguese, and British auxiliaries, after a siege and blockade of two years, forced the French garrison to capitulate. The inhabitants claimed the protection of England, and the status of Malta as a British dependency dates from its recognition as such by the Congress of Vienna in 1814. See Saint John, Knights of. Consult: Miège, *Histoire de Malte* (Paris, 1840); Seddall, *Malta, Past and Present* (London, 1870); Bono, *Breve compendio della storia di Malta* (Malta, 1899); Ballou, *The Story of Malta* (Boston, 1893); Bedford, *Malta and the Knights Hospitallers* (London, 1894); Tullack, *Malta Under the Phœnicians, Knights, and English* (London, 1861); Winterberg, *Malta, Geschichte und Gegenwart* (Vienna, 1879).

MALTA, Ancient and Illustrious Order of Knights of. A fraternal and beneficial order, incorporated in America as a fraternal beneficial order in 1889. The order is composed of one supreme commandery, which is the executive branch, five grand commanderies, and 234 subordinate commanderies, which represent a total membership in America of 27,000. The total amount of disbursements for benefits to the beneficiaries of deceased members in 1902 was $40,502.

MALTA, Knights of. See Saint John of Jerusalem, Knights of.

MALTA FEVER, or Mediterranean Fever, Rock Fever, Neapolitan Fever, Undulant Fever, etc. A disease caused by the Micrococcus melitensis and characterized by fever, profuse perspiration, constipation, pain, and swelling in joints, enlargement of the spleen, and frequent relapses. This affection has a wide distribution along the Mediterranean coasts. There is no specific medicinal treatment known. Cold sponging, antipyrin, hypnotics, the application of iodine to the painful joints, aperients, and a diet of milk and broth form the treatment desirable, with a change of climate as soon as the patient is fit to move with comfort.

MALTE-BRUN, măl′te-br͞oon′, *Fr. pron.* mȧlt′brăɴ′, Konrad, properly Malte Bruun (1775-1826). A Danish geographer, born at Thisted, Jutland. He studied in Copenhagen, and because of sympathy with the French Revolution and bitter pamphleteering against the Government, was in 1800 condemned to perpetual banishment. He sought refuge in Paris, where he maintained himself by teaching and literary labors. In 1808 he began the *Annales des voyages, de la géographie et de l'histoire* (24 vols.), which he concluded in 1814, and in 1818 began, with Eyriès, the *Nouvelles annales des voyages*. For some time he was joint editor of the *Journal des Débats*, but is principally known for his geographical works, chief of which is the *Précis de la géographie universelle*, completed by Huot, 8 vols., with an atlas (Paris, 1810-29; 6th ed. 1853). He took part also in the preparation of the *Dictionnaire de la géographie universelle* (Paris, 1821 et seq.), and was secretary to the Geographical Society of Paris.—His son, Victor Adolphe (1816-89), was one of the eminent geographers of France, taught at various institutions, and succeeded his father as secretary of the Geographical Society of Paris. He published *La France illustrée* (1855), *Géographie universelle* (1874), *L'Allemagne illustrée* (1884-85), and other geographical works.

MALTESE. The name of a breed (1) of cats and (2) of lap-dogs. The Maltese or blue cat is so called on account of its uniform bluish-gray color. (See CAT, paragraph *Domestic Cat.*) The dog is supposed to have originated in Malta.

MALTESE CROSS. A cross of eight points, of the form worn as a decoration by the Hospitallers and other orders of knighthood. See illustrations to HERALDRY.

MAL'THA (Lat., from Gk. *μάλθα*, mixture of wax and pitch for calking ships). A name originally applied to a mineral fat from Kirwan, resembling wax and probably composed of paraffin. The name is now applied to the semi-solid or viscous varieties of bitumen. It is of black color, with a specific gravity of 1 or a little less. Mineral tar is a popular name for it. Maltha resembles petroleum in composition, but differs from it in containing a smaller percentage of the lighter oils. Indeed, it may at times have been formed by the oxidation and evaporation of petroleum on exposure to the air. In the United States it is found in California, where it oozes from the rocks in certain localities. See BITUMEN; ASPHALT.

MALTHUS, măl'thŭs, THOMAS ROBERT (1766-1834). An English economist. He was educated by private tutors at his home, at a small academy at Warrington, and at Cambridge, where he received the degree of B.A. in 1788. The following years he devoted to the study of physical science, with, however, a growing interest in social problems. In 1791 he received the degree of M.A. and in 1793 a fellowship in his college, and took a curacy near Albury. The publication of William Godwin's *Enquirer*, which argued for a reconstruction of society on a basis of equal distribution of goods, inspired Malthus to a study of population, the fruit of which was the *Essay on the Principle of Population as It Affects the Future Improvement of Society* (1798), which was published anonymously. The main thesis of this work was that population in all times has tended to outgrow subsistence. The means of subsistence, Malthus argued, might increase in arithmetical progression; but population tended to increase in a geometrical ratio. Accordingly there could be no permanent amelioration of the lot of the lower classes; a redistribution of wealth might bring them plenty for a time, but population would soon overtake subsistence, and would as before be kept in check by starvation or vice, unless checked by self-restraint. In 1803 a second edition of the *Essay on Population* appeared. In this edition Malthus defends his proposition by a wealth of data relating to civilized, barbarous, and savage peoples. Here as in later editions he is more disposed to dwell upon the necessity of moral restraint as a preventive of over-population, and less inclined to regard vice and misery as the inevitable fate of the mass of humanity.

The importance of this work for economic thought can hardly be overestimated. Before the publication of the *Essay on Population*, it was held even by statesmen like Pitt that increase in population is always an unqualified advantage for a State. The arguments of Malthus quickly dispelled this belief, and served to direct public sentiment against a poor law that was rapidly filling England with paupers. In economic science the 'Malthusian doctrine' has played an important part in every theory of wages propounded since its enunciation; and in a widely different department of thought—biology—the work of Malthus has the distinction of having suggested to Darwin the influence of the struggle for survival upon progress.

In 1805 Malthus was appointed professor of political economy at the East India Company's College at Haileybury. He entered upon his duties there in 1807 and occupied that position until his death. Of his other works, the *Nature and Progress of Rent* ranks high among the original contributions to political economy. In this essay the 'law of diminishing returns,' afterwards identified with the name of Ricardo, is stated with great clearness. Little of importance was added by his *Political Economy* (1820), and by his numerous economic pamphlets.

No economic writer has been more harshly criticised than Malthus. 'Malthusianism' still designates an attitude of hard-hearted indifference to the sufferings of the poor. Because of the extravagance of some of his followers, the Neo-Malthusians, who sought to popularize artificial methods of checking the growth of population, Malthus has frequently been denounced as an exponent of immorality. His *Essay on Population* has received numberless 'refutations,' but scientific economists are agreed that when divested of its too absolute form of expression, the doctrine of Malthus enunciates an indisputable truth, which cannot be ignored with impunity by any plan of social amelioration or reform. See POLITICAL ECONOMY.

BIBLIOGRAPHY. The best work on Malthus is Bonar, *Malthus and His Work* (New York, 1885). For a brief analysis of his work, consult Palgrave, *Dictionary of Political Economy*, article "Malthus."

MALTING. See BREWING.

MALTON, mạl'ton. A market-town in the North Riding of Yorkshire, England, on an elevation on the Derwent, 18 miles northeast of York (Map: England, F 2). It has foundries, agricultural implement works, and large stables and training schools for race horses. It has a grammar school, founded in 1545, and the remains of a priory, founded in 1150. Population, in 1891, 4910; in 1901, 4800. Malton, called by the Romans *Camulodunum*, was an important Roman military station. The town was burned and rebuilt in the reign of Stephen, after which it was generally called New Malton.

MALT SPROUTS (AS. *mealt*, OHG. *malz*, Ger. *Malz*, from AS. *meltan*, *miltan*, to melt; connected with Gk. *μέλδειν*, *meldein*, to liquefy, OChurch Slav. *mlŭdŭ*, soft, and ultimately with OHG. *smelzan*, Ger. *schmelzen*, Eng. *smelt*). The sprouts or radicles of germinated grain, separated before the malt is used, and also the exhausted grain residue; a by-product from breweries, resulting in the preparation of malt from barley. The barley is sprouted to develop the principle of malt in the grain, and when the process has proceeded far enough it is checked, and the sprouts are broken off. The sprouts and the brewers' grain are fed to cattle and parts of the refuse are sometimes used as fertilizers. The average percentage composition of malt sprouts is: Water, 10.2; ash, 5.7; protein, 23.2; fibre, 10.7; nitrogen-free extract, 48.5; and fat, 1.7 per cent. See BREWING.

MALTZAN, mäl'tsȧn, HEINRICH, Baron (1826-74). A German traveler and ethnologist, born in

Dresden. He studied law at Heidelberg, traveled in the East, and familiarized himself with the habits and languages of the inhabitants of Algeria, where he lived for several years. He traveled to Abyssinia in 1857, and made a ceremonial pilgrimage to Mecca in 1860 and then returned to the northern coast of Africa, where he made researches in Tunis and Tripoli (1867-69). He wrote: *Drei Jahre im Nordwesten von Afrika* (1863); *Meine Wallfahrt nach Mekka* (1865); *Reise auf der Insel Sardinien* (1869); *Reise in Tunis und Tripoli* (1870); and *Reisen in Arabien* (1873).

MA'LUM IN SE, AND MALUM PROHIB'ITUM. *Malum in se* (Lat., evil in itself) is a term which is applied to crimes which involve moral turpitude or wrong in their very nature, such as murder or theft. *Malum prohibitum* (Lat., prohibited wrong) is applied to offenses which are not morally wrong in their nature, but are prohibited by statute and therefore unlawful. The distinction is useful in determining proper measures of punishment. Any person may be presumed to have a moral sense of right and wrong, but may nevertheless ignorantly and unintentionally violate some statute or ordinance which does not involve moral transgression. See CRIME.

MALUS, mȧ'lụs', ETIENNE LOUIS (1775-1812). A French military engineer and physicist, born at Paris, and educated at the École Polytechnique. He served in the Army of the Rhine, was attached to the Egyptian expedition, was present at the siege of Cairo, and came back to France in 1801. He then took charge of the fortifications at Antwerp and Strassburg, at the same time carrying on his scientific researches. His *Traité d'optique*, published in 1811, treats of the refraction and reflection of light, and contains experiments in regard to the reflection of light by transparent media. Malus in the course of his experiments discovered that the phenomenon known as the polarization of light would be produced by reflection. As he believed in the emission theory, he advanced the hypothesis that particles of light have poles, and that on entering a doubly refracting crystal, some of the particles forming one of the rays may be so arranged as to be transmitted through it, while the particles which should have formed the other ray may be so arranged as to prevent their transmission in certain directions. (See LIGHT.) Malus published an account of his experiments in the *Memoirs* of the Institute, which at once elected him to its membership; and the English Royal Society gave him the Rumford medal, though France and England were then at war. In 1810 he published his *Théorie de la double réfraction de la lumière dans les substances cristallisées*, which was crowned by the Institute.

MALVA'CEÆ (Neo-Lat. nom. pl., from Lat. *malva*, mallow). An order of dicotyledonous plants, of which about 35 genera and 800 species, chiefly tropical, are known, most abundant in America, although the most important species belong to the Old World. They are herbs, shrubs, and in tropical countries occasionally trees; with alternate, entire, or lobed leaves; the pubescence, if any, starry; the flowers showy, generally on axillary stalks; the calyx generally of five sepals or five segments, often with an epicalyx; the petals generally five, hypogynous, twisted in the bud; the stamens numerous, united by their filaments; the ovary consisting of a number of carpels around a common axis, the styles generally five, the ovules few or many; the fruit dry or fleshy. The plants of this order contain a mucilaginous substance in great quantity, which is particularly abundant in the roots of the perennial herbaceous species. The seeds contain a considerable quantity of bland fixed oil. The inner bark of the stem often yields a useful fibre, for which species of Hibiscus and Sida are particularly valued. Cotton belongs to this order. Many species are frequent ornaments of flower-gardens. (See COTTON; HIBISCUS; HOLLYHOCK; MALLOW; MARSH-MALLOW; URENA.) By some botanists the silk trees, Bombax and Eriodendron, are united with this order. The classification of Schumann, with the chief genera, is: Malopeæ, *Malope* and *Kitaibelia;* Malveæ, *Abutilon*, *Malva*, *Althæa*, *Anoda*, and *Lavatera;* Ureneæ, *Urena* and *Pavonia;* and Hibisceæ, *Hibiscus* and *Gossypium*.

MALVERN, măl'vẽrn. A town and the county-seat of Hot Springs County, Ark., 22 miles southeast of Hot Springs; on the Saint Louis, Iron Mountain and Southern Railroad, at the junction of the Hot Springs Railroad (Map: Arkansas, C 3). It is surrounded by a cotton and fruit growing district, and has manufactures of flour, bricks, and lumber. Population, in 1890, 1520; in 1900, 1582.

MALVERN, GREAT. A town and inland watering-place in Worcestershire, England, picturesquely situated on the eastern side of the Malvern Hills, 8 miles southwest of Worcester (Map: England, D 4). Its mean annual death rate is less than that of any other watering-place in the Kingdom, owing to the purity and abundance of the spring water, and the remarkable salubrity of the climate. It has chalybeate, saline, and alkaline springs, and is a great summer resort. Its restored eleventh-century priory church is famous. Population, in 1891, 14,400; in 1901, 16,400.

MALVERN HILL, BATTLE OF. A battle fought on July 1, 1862, at Malvern Hill, Va., near the north bank of the James River, about 15 miles southeast of Richmond, between the Federal Army of the Potomac, numbering about 80,000 men, under General McClellan, and the Confederate Army of Northern Virginia, also numbering about 80,000, under General Lee. It was the last of the 'Seven Days Battles' (q.v.) in the Peninsular campaign. After the engagements at White Oak Bridge and Glendale on June 30th, the whole of the Federal army was stationed on Malvern Hill, an eminence about sixty feet in height, by nature a position of great strength. General Fitz John Porter was in immediate command, General McClellan having absented himself to confer with Commodore Rodgers on the gunboat *Galena*. Late in the afternoon of the 1st, the Confederates, under the immediate command of Generals D. H. Hill, Huger, and Magruder, advanced against the position, though there had been an almost continual artillery fire throughout the morning; and the fighting continued with slight intermission until nine o'clock in the evening, when the Confederates, having sustained heavy losses, finally withdrew without making any impression on the

Federal lines. The Federal artillery, which proved exceedingly effective throughout the battle, and was so posted that the fire of sixty guns could be concentrated on any point, was under the general direction of Colonel Hunt. During the battle also a fire from the gunboats in the rear of the Federals did some execution in the Confederate ranks. The exact losses of the two armies at Malvern Hill were never accurately determined, but it is estimated that the Confederates lost more than 5000 in killed and wounded and the Federals about one-third of that number. Consult: Johnson and Buel (eds.), *Battles and Leaders of the Civil War*, vol. ii. (New York, 1887); Michie, *General McClellan* (New York, 1901), in the "Great Commanders Series;" and Webb, *The Peninsula* (New York, 1881), in the "Campaigns of the Civil War Series.",

MALVOISIE WINE. See Wine.

MALVOISIN, mȧl′vō-zĭn, or **MAWMOISINE**, mạ′moi-zĭn, William (?-1238). A Scottish ecclesiastic. He was born in Normandy and educated in France. Going to Scotland, he was made one of the *clerici regis* and Archdeacon of Saint Andrews. In 1199 he was constituted Chancellor of Scotland; in 1200 Bishop of Glasgow, in 1202 of Saint Andrews; in 1211 he resigned his chancellorship; in 1212 by appointment of the Pope he convoked at Perth a great council of the clergy and people to press upon the nation the Pope's will and command that an expedition be undertaken to Palestine, but the nobles received the proposition coldly. In 1214 he attended the coronation of King Alexander II., and is said to have placed the crown on his head. The following year he went with the bishops of Glasgow and Moray to Rome to attend the fourth Lateran Council, remaining abroad until 1218. On his return he effected the deliverance of Scotland from the Papal ban. He brought from the Continent various orders of monks and mendicants before unknown in Scotland, and established convents of black friars at several places. He died in Inchmurtach, near Saint Andrews, July 5, 1238.

MALVO′LIO. In Shakespeare's *Twelfth Night*, steward to Olivia. A pompous, solemn fellow, when deceived by Sir Toby's letter he fancies his mistress in love with him.

MÄLZEL, mĕl′tsĕl, Johann Nepomuk (1772-1838). A German inventor of musical mechanisms, born at Ratisbon. At first a music-teacher, he soon became famous for his inventions, among them a sort of orchestrion, a mechanical chess-player, and an automatic trumpeter. In 1808 he was made Court mechanician at Vienna. He constructed a number of ear-trumpets, one of which was used by Beethoven. He was credited with having invented, in 1816, the metronome (q.v.), but in this he was anticipated, probably by Winkel of Amsterdam. He died while en route for the United States.

MAM, măm. One of the three principal Mayan tribes of Guatemala, the other two being the Cakchiquel (q.v.) and Quiché (q.v.). The Mam are located chiefly in the western part of the State. but extend into the adjacent districts of Chiapas, Mexico. The name signifies 'ancestral,' in allusion to the archaic forms of the language.

MAMÁNUA, mȧ-mä′nōō-ä. A Negrito people in northeastern Mindanao. See Philippine Islands.

MAMARONECK, mȧ-măr′ō-nĕk. A town, including the village of Larchmont and part of Mamaroneck village, in Westchester County, N. Y.; on Long Island Sound, and on the New York, New Haven and Hartford Railroad (Map: New York, G 5). It is a popular suburb of New York City and has many handsome residences. Larchmont village (incorporated in 1891) is the home of the well-known Larchmont Yacht Club. Population, in 1890, 2385; in 1900, 3849; Larchmont, in 1900, 945.

MAMBÁJAO, mȧm-bä′hou. A town of the Province of Misamis, Philippines, situated on the northeast coast of Camiguín Island, off the north coast of Mindanao (Map: Philippine Islands, J 10). Population, 18,000.

MAMBER. The common wild goat of Southwestern Asia and Asia Minor. See Goat.

MAMBRES, măm′brēz. See Jannes.

MAMBRINO, mȧm-brē′nō. A pagan king of Bithynia, mentioned in old Italian versions of the Charlemagne epic and further described in Ariosto's *Orlando furioso*, in which Mambrino is killed by Rinaldo. He wore a helmet of gold, which had the power of making the wearer invisible. This helmet figures in *Don Quixote*, who, on seeing a barber wear a brass basin as a hat, declared it to be the magic helmet and wore it as such.

MAMBÚSAO, mȧm-bōō′sou. A town of Panay, Philippines, in the Province of Cápiz, situated on the river Malinannang, 16 miles southwest of Cápiz (Map: Philippine Islands, E 6). Population, in 1896, 11,000.

MAMELI, mȧ-mā′lē, Goffredo (1827-49). An Italian poet and patriot, born at Genoa. His father was Admiral Giorgio Mameli. He wrote a tragedy founded on Genoese history when but sixteen years old, and his verses, *L'Alba* and *Fratelli d'Italia*, became the campaign songs of 1848. He served under Garibaldi as aide-de-camp and in the defense of Rome (1849) was fatally wounded. Mazzini wrote an introduction to the edition of his poems published at Genoa in 1850. The best edition is that of Tortona (1859).

MAMELUCO, mä′mȧ-lōō′kō. The name given in Central Brazil to the half-breed offspring of whites or negroes and Indians. It evidently has reference to the Mamelukes.

MAM′ELUKES (from Fr. *mameluk*, *mamaluc*, from Ar. *maml[illegible]k*, purchased slave, from *malaka*, to possess). A dynasty of Egyptian sultans who ruled from 1250 to 1517. The name was originally applied to the Turkish slaves who were brought in large numbers into Egypt and came to constitute the main strength of the army, filling at the same time the highest posts in the State. In time the Mamelukes were recruited by large numbers of Circassian slaves. In 1250 the last Ayubite ruler died and the power fell into the hands of the Emir Eybek, who married Sheger-ed-Durr, the mother of the dead monarch. The dynasty founded by Eybek is known as that of the Bahrite Mamelukes. Eybek was killed in 1257 and the government was assumed by the Viceroy Kutuz, who in 1260 gained a notable victory over the Mongols, and established his power over Syria. The celebrated Bibars ruled from 1260 to 1277. He waged war against the Christians in Syria, and in 1268 put an end to the principality of Antioch. His armies overran Armenia and penetrated far into Asia Minor. His power toward the south extended as far as Nubia. Al-Mansur (1279-90) carried on successful wars against the Mongols and Christians. He took Damascus and made himself master of Tripolis, which for two centuries had been held by the Christians. Al-Mansur's two sons ruled in succession and increased the power of the sultanate, while at the same time the condition of the people was improved by the construction of important public works. Cairo was greatly beautified and rose in importance as one of the capitals of the East. There followed a period of steady decline during which the real power passed from the hands of the Sultans to the commanders of the troops, which were now largely composed of Circassians. In 1389 the last Bahrite ruler was deposed and Barkuk, first of the Circassian or Burgite Mamelukes, ascended the throne. During the reign of Barkuk Egypt was threatened by the power of Timur, who wrested from Barkuk's son, Faraj, a great part of Syria. Barsa Bey (1422-37) reduced Cyprus to the position of a vassal State, and exercised considerable influence in the Eastern Mediterranean. Kait Bey (1467-96) carried on war against Sultan Bajazet II. in support, partly, of the claims of the latter's brother, Jem. After Kait Bey's death, five sultans ruled within as many years, most of them perishing by assassination. In 1501 Kansuh El-Ghuri was raised to the throne. After reigning for fifteen years, he engaged in war with the Turkish Sultan, Selim I., and was overthrown and slain in a sanguinary battle at Marj Dabik, near Aleppo (1516). The Mamelukes under Tuman Bey II. resisted the invasion of Egypt by Selim and fell in large numbers on the field or during their desperate defense of the capital. Their dynasty disappeared from the throne, and Egypt became a Turkish province (1517). To conciliate the surviving Mamelukes, Selim divided Egypt into twenty-four military provinces and placed Mameluke beys over them subject to the supreme authority of a Turkish pasha. With the decay of the Turkish Empire, the Mameluke beys arrogated to themselves greater powers and finally ruled in almost virtual independence. Napoleon encountered the Mamelukes under Murad Bey in the battle of the Pyramids, July 21, 1798, and utterly defeated them. After the expulsion of the French from Egypt the Mamelukes contended with the Turks for dominion. The ambitious Mehemet Ali (q.v.) determined to crush and exterminate this military aristocracy. On August 17, 1805, more than one hundred of the Mamelukes were enticed into Cairo and slaughtered. On March 1, 1811, treachery was again resorted to and nearly 470 Mamelukes were shot down in the citadel at Cairo. This was followed by a general slaughter of Mamelukes all over Egypt. A remnant of them fled to Nubia, where they were followed by Ibrahim Pasha (q.v.), who put to death some and dispersed the rest. With their disappearance, Egypt was rescued from the conditions of anarchy into which the struggle of the beys had plunged it for so many years. Consult Makrizi's history of the Mameluke sultans, translated by Quatremère (3 vols., Paris, 1837-41).

MAMER'CUS. The son of Numa Pompilius, and the name of a prominent Roman family of the Æmilian gens which traced its descent to him.

MAM'ERTINE PRISON, The, called also the *Carcer Tullianum*. One of the few remains of the ancient Rome of the royal period, and, next to the walls of *Roma Quadrata*, the earliest building extant. It is of three periods: to the earliest—supposed traditionally to be the time of Ancus Marcius—belongs the lower chamber; to the second, still in the royal or more probably the early republican era, belongs the upper chamber; to a restoration of much later date (Tiberius), is due the façade built when part of the circular chamber was cut off. The original chamber was circular, with a false pointed dome, its walls being built of large blocks set in overhanging courses. It is a matter of dispute whether this chamber was used as a well, a theory favored by the name *Tullianum* (from *tullus*, 'a spring'), or as a royal or princely tomb, a theory favored by many analogous examples and by the absence of water corrosion. When the upper chamber was built, presumably for a prison (Livy i. 33, 8), the builders discovered the earlier building below it and made an awkward connection by cutting off the upper part of the false dome and covering the opening with flat slabs which formed the floor of the upper chamber, with a connecting trap-door. This floor was considerably above the level of the Forum, on the declivity, and was reached by a flight of stairs called the *Scalæ Gemoniæ* ('stairs of sighs'), where the execution of important prisoners took place and their bodies were exposed during the triumphal processions, before the ascent to the Capitol. The Mamertine Prison itself is connected with many of the most tragic events of Roman history. Its horrors were described by Sallust. King Jugurtha was starved in it, and Lentulus, Cethegus, and others who had conspired with Catiline were killed here.

MAMERTINES (Lat. *mamertini*, sons of Mars). The Campanian mercenaries of Agathocles, ruler of Syracuse, who in B.C. 282 seized the town of Messana and were instrumental in bringing on the First Punic War through their requests made both to the Romans and Carthaginians for and against Hiero of Syracuse (B.C. 264).

MAMIANI DELLA ROVERE, mä'mē-ä'nē dĕl'lä rō-vā'rā, Terenzio, Count (1799-1885). An Italian poet, philosopher, and statesman, born at Pesaro. From boyhood a patriot, he was concerned in the quasi-revolution that followed the accession of Gregory XVI., was captured by the Austrians, and after a short imprisonment went to France. Upon his return to Italy in 1847 he held the post of Minister of the Interior under Pius IX. from May to August, 1848. He then went to Turin, where he founded with Gioberti the 'Society for the Advancement of Italian Unity.' He was recalled to Rome, and after the flight of the Pope took the portfolio of Foreign Affairs under Galetti, but held it only for a few weeks. When the French took the city in 1849, Mamiani withdrew to Genoa and established the Accademia di Filosofia Italica. He was elected Deputy from Genoa in 1856, and later Cavour gave him the post of Minister of Public Instruction (1860). Afterwards he was made

Minister to Athens in 1861 and to Bern in 1865. He was also professor of history and philosophy at the University of Turin and editor of *La filosofia delle scuole italiane.* His works include: *Poesie* (1857); *Del rinnovamento della filosofia antica italiana* (1834); *Dialoghi di scienza* (1848); *Le confessioni di un metafisico* (1865); *D'un nuovo diritto Europeo* (1859); *Psicologia di Kant* (1877); *La religione dell' avvenire* (1879); and *Critica delle rivelazioni* (1880).

MAMIL'IA GENS. A plebeian gens at Rome, originally a family of Tusculum, which traced its origin to the daughter of Telegonus, the reputed founder of Tusculum. It comprised three families, Limetanus, Turrinus, and Vitulus.

MAMÆ'A, JULIA (A.D. ?-235). A Roman lady, mother of the Emperor Alexander Severus. A niece of Septimius Severus, she was born in Emesa, Syria; was a woman of high principle, and educated her son so well that he was a model of all virtues save generosity. Mamæa's greed and parsimony roused to revolt the soldiers, who killed her and her son. Ulpian was one of her advisers, and tradition makes her not unfriendly toward the Christians.

MAMMA'LIA (Neo-Lat. nom. pl., from Lat. *mammalis*, relating to the breast, from *mamma*, Gk. *μάμμη mammē*, breast). The highest class of vertebrates, which includes man, his domestic animals, and all others that suckle their young—the mammals. Mammals are warm-blooded; that is, the temperature of the body is kept approximately at a fixed point, generally higher than that of the surrounding medium. The fixed optimum temperature differs in different mammals, but it is about 100° F.

DEVELOPMENT AND NOURISHMENT OF YOUNG. The most distinctive character of the mammalia is their mode of development and of nourishment during the earliest period of life. Excepting only the lowest forms (Prototheria), all are brought into the world alive, not merely by the retention and hatching of the egg within the oviduct, but by the formation of a new connection between the embryo and its mother. The minute ovum (see EMBRYOLOGY, HUMAN) on reaching the uterus (or womb) connects itself by a set of root-like tufts of vessels with the maternal vessels in the wall of the uterus. These tufts form an organ called 'placenta,' by which the embryo absorbs nutriment from the mother's blood, and which conveys back to the mother's circulation for excretion by her the waste products of metabolism.

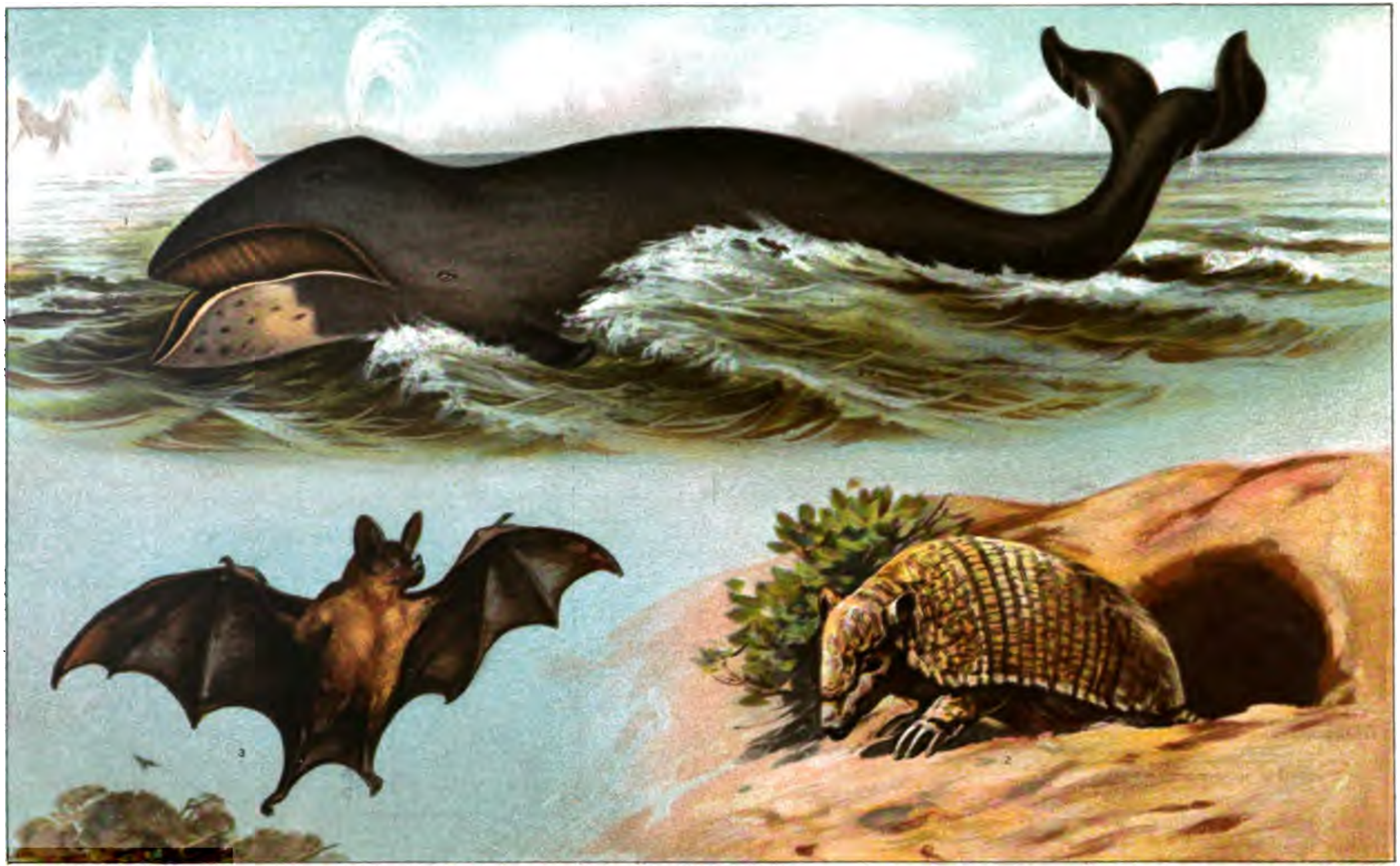
All mammals nourish their young (which at first are unable to digest any other sort of food) upon milk (q.v.), a richly nutritious fluid secreted by the mother's body in 'mammary' glands, which become greatly developed in the female during the periods of gestation and lactation; and, as this is found in no other class, it is the character by which the entire group is most positively defined, and from which it derives its name. The mammary glands exist in both sexes, but, except in very rare cases, it is only in the female that they secrete milk. Their number is never less than two, and, when more, is generally nearly proportional to that of the young produced at each birth. That there is direct connection beween the number of young and the number of teats has recently been shown in the case of ewes which have been bred to throw two, three, or more young at a birth. In such cases the number of teats has increased proportionately. Their position varies, being determined in each case by convenience of approach by the suckling young. In the whales, where prolonged sucking would be difficult on account of their aquatic life, the ducts of the glands are dilated to form a reservoir from which the milk is ejected into the mouth of the young by a compressor muscle of the mother. In the Prototheria (q.v.) the mammary glands have no teats, but the milk simply oozes out through numerous pores. In the marsupials the teats are well developed, but the glands are provided with special muscles by which milk is forced into the mouth of the extremely rudimentary young in the mammary pouch. The skin in the mammalia produces a covering of hair (q.v.), which is a peculiar characteristic of this group, so that it would be a sufficient definition of a mammal to say that it is an animal producing hair. In some, however, it is modified into bristles, scales, and other unusual forms, or it may be almost wholly absent, as in whales.

The general structure is typified by that of man, and is abundantly described elsewhere, so that no more need be said here than a few words in reference to the cranium. Among the most characteristic points in the mammalian skull it may be mentioned generally (1) that the lower jaw articulates directly with the skull, there being no intervening tympanic bone, such as occurs in the other vertebrates; and (2) that the occipital bone of the skull articulates with the first vertebra by two condyles, one on ether side of the occipital foramen, as in amphibians, instead of by a single condyle, as in the reptiles and birds. In proportion as a mammal is remote in relationship from man, we find that the cranium is diminished; that the face is prolonged by extension of the jaws and nasal cavities; that the orbits are directed outward, and are less distinct from the temporal fossæ; and that the occipital foramen and condyles are placed toward the posterior part of the skull, instead of occupying the middle of its inferior surface, as in man. For further information as to anatomy and physiology, see the articles SKELETON; TEETH; and those upon the various organs and functions of the human body, with the articles on comparative anatomy accompanying them; also articles upon the various groups of mammals, as CARNIVORA; RUMINANT; ELEPHANT; and the like.

Mammals are very generally distributed over the surface of the globe, and the details in regard to the distribution of the various subclasses and orders are extremely interesting. Among some of the most important facts may be mentioned the absence of mammals from New Zealand and oceanic islands; the restriction of monotremes and all marsupials (except the American opossum) to Australasia; and the peculiar mammalian fauna of Madagascar. See DISTRIBUTION OF ANIMALS.

With respect to their natural history, the part they play in the interrelations of the living world, and their economic service to man, a large volume might easily be written. Mammals are found under all possible conditions of life; they inhabit the air, trees, surface of the earth and subsoil, and fresh and salt water, from the equator to the poles. They thus exhibit an extra-

MAMMALS OF EARTH, AIR, AND WATER



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1 GREENLAND RIGHT WHALE - BALÆNA MYSTICETUS 2 GREAT ARMADILLO - DASYPUS GIGAS
3 SPECTRAL BAT - PHYLLOSTOMA SPECTRUM

ordinary variety of adaptations, and are affected by and react upon all conditions of existence. Where room is almost unlimited and food abundant and perennial, great size is attained, as in the whales, which reach a length of 100 feet and corresponding bulk and weight; elephants, which may weigh five tons; and the great grazers, which often exist in vast herds; and, on the other hand, many forms, adapted to a very limited range of vital conditions, are minute in size. Between these extremes is a wide range of size, power, and adaptability to climate and food, so that hardly any organic thing, alive or dead, escapes being eaten by some mammal. On the other hand, they themselves form the food of each other, and of all other flesh-eating creatures in a greater or less degree. In respect to food the mammals fall into two great categories—vegetable-feeders and flesh-eaters, with a few forms that may be omnivorous. The vegetable-feeders (Edentata, Sirenia, Ungulata, and Rodentia) are likely either to be of large size or exceedingly numerous in individuals, or both. They are ill provided with weapons of defense or offense; trust for safety to powers of swift escape or of skillful hiding; and as a rule are sluggish and inferior in brain power. It is their part (from the present point of view) to elaborate from the semi-crude nutriment in vegetation the more compact and highly nutritious substance called flesh, which is to be used by their superiors in organization; their mission in life is to provide a prepared food for the carnivores. These qualities also make them useful to man, and it is from this class that he derives almost everything in the way of food, oil, clothing, and service which animals contribute to his welfare.

The flesh-eaters include two aberrant groups—the aërial insect-catching bats, and the marine Cetacea, the latter, by the peculiarities of their respective habitats and the restricted character of their food, having a special place and special functions. A few forms of antiquated organization, small size, much restricted range, and inferior abilities generally feed upon insects alone (Insectivora) or in large part (Primates), and share the perils of the vegetable-eaters. The greater part of the flesh-eaters, however, form a group (the order Carnivora) which in complexity of organization, power, resourcefulness, and general ability stands at the head of the animal kingdom. Whatever may have been the case with the extinct and unknown ancestry of man, there is no question that the cats and weasels and their kin are far superior even to the anthropoid apes in those powers and abilities which make for mastery in the animal world. These remarks have applied mainly to the eutherian mammals; but a similar division is found in the Metatheria (marsupials); and this circumstance is an argument in favor of the theory of the independent origin and development of that group, and opposed to the view which regards it as a stage in the evolution of the mammalian stock. In both groups the vegetable-feeders are numerous, large, timid, comparatively defenseless, and without either means or desire for aggression, except as between males of the same species. They get their food with comparatively little exertion, and, except in the case of certain rodents, have had occasion to develop few instincts or mental faculties. Their whole life is passed in an effort to escape by fleetness or to find and keep a hiding place; and here mainly have been developed such devices as illustrate protective coloration and mimicry (q.v.) in this branch of the animal kingdom.

The carnivores, on the other hand, have been compelled to work day by day for their subsistence. They have been obliged to overcome by strategy and cunning, as well as by force, the greater size and speed of many of the flesh-eaters, and to oppose quickness, patience, and wit to the numberless defensive and protective abilities and devices of the smaller and more secretive animals; and they have been forced to do this in close and constant competition with other carnivores. Hence the apparatus of claws and carnassial teeth, developing the canines rather than the incisors; the tireless, efficient muscles; the capability of sudden tremendous exertion and equally of great endurance; the vigilance, courage, subtlety, and resourcefulness which characterize cats, wolves, foxes, dasyures, weasels, and lesser beasts of prey. Developed by such a history of contest and courage, it is not strange that ferocity and self-reliance should characterize the disposition of the carnivores, nor that mankind in its progress toward peace has found itself in competition with them for the possession of the best of their prey—the edible herbivores—and also at war with them for its own defense. It is wonderful, however, that man should have derived from this class such friends and helpers as the cat and dog, and no stronger evidence could be adduced in favor of the proposition that the Carnivora represent the highest animal mental development than the tractability of the dog and cat, and the mental qualities they have exhibited under man's control and tutelage.

Classification. Linnæus (1766) divided the mammals into seven orders: Cete, Belluæ, Pecora, Glires, Feræ, Bruta, Primates. Of these orders the Cete, Glires, and perhaps Belluæ and Pecora were natural groups quite similar to some of our modern orders. But under Feræ were grouped opossums, moles, hedgehogs, weasels, bears, dogs, cats, and seals; evidently the use of animal food was the principal character common to such an assembly. Under Bruta, moreover, such widely different animals as elephants, anteaters, and sloths were united. Finally, in the Primates, not only were man and monkeys associated, but even the bats were included. Cuvier reformed this arrangement as a result of extensive anatomical investigations. He recognized nine orders of mammals, as follows: Bimana, Quadrumana, Carnivora, Marsupialia, Rodentia, Edentata, Pachydermata, Ruminantia, Cetacea. There is little that is really unnatural in this arrangement, and it remained in popular use down to the very close of the nineteenth century. Cuvier regarded man's intellectual qualities as such as to rank him in an order apart from the monkeys, a backward step from Linnæus's arrangement. His Bimana and Quadrumana are now fused as Linnæus's 'Primates,' and Cuvier's Pachydermata and Ruminantia are likewise united; but his other orders stand substantially as made. After the doctrine of organic evolution was generally accepted, the tendency was toward a far more elaborate and complex classification among both animals and plants. As a result, some of the proposed classifications of mammals suggested no less than twenty-five orders; but the pendulum soon reached its limits on that side, and we are now far nearer a natural classification than we have ever been previously. It is generally agreed now that the class Mammalia is very naturally divisible into two subclasses, according to the arrangement of the reproductive organs and the relations between mother and offspring. The primary divisions ought to be based on such characters, for it is in just those characters that the mammals stand out in sharpest contrast to the other vertebrates. These two subclasses are:

(1) Prototheria, or Ornithodelphia—mammals without teats.

(2) Theria, or Eutheria—mammals with teats, arranged according to two plans:

(a) Metatheria, or Didelphia.

(b) Eutheria (proper), or Monodelphia.

In the Prototheria the female reproductive organs resemble those of birds. There is no vagina, the oviducts opening separately into the cloaca, and the uteri are merely enlargements of the oviducts. The eggs contain much yolk, are supplied with albumen and covered with a shell as in reptiles and birds. They are laid in a nest at the end of a burrow and are hatched very soon, possibly in twenty-four hours. The mammary glands have no teats, any part of the longitudinal depression along the centre of the abdomen (the primitive pouch) serving that purpose when the sucking mouth of the young one is applied to it. This group contains but one order, Monotremata.

The Theria are mammals in which the mammary glands are provided with teats, and there is a more or less perfect allantoic development. These two facts, especially, have led zoölogists to join into a single group the Metatheria and Eutheria, hitherto regarded as separate groups of coördinate rank with Prototheria. These groups are thus distinguished:

In the Metatheria (Didelphia of early authors) the oviducts of the female are united in a longer or shorter part of their length, and there is no cloaca, though the urogenital and anal openings are surrounded by a common sphincter muscle; each oviduct possesses a well-formed uterus. There are thus two uteri, whence the name 'Didelphia.' The eggs of the Metatheria have little yolk and no shell. They lie in the uteri without becoming very firmly united to the walls, in some species not at all; in others, however, there is formed quite a distinct placenta. (The foregoing groups have been called 'Aplacentalia.') But the young remain in the uteri only a short time; even in the giant kangaroo, the largest of the subclass, they are born on the 39th day. When born, they are transferred by the mother to her pouch, where each one is placed on a teat, to which it clings automatically. This interesting subclass, like the preceding, contains but one order, the Marsupialia (q.v.).

The Eutheria comprise all the remaining (higher) mammals. In these the marsupium is absent, the vagina is fully formed and single, and there is only one uterus. The egg of the Monodelphian mammal is very minute, almost without yolk, and becomes closely connected with the wall of the uterus as soon as it enters that organ. (Hence this group has been called 'Placentalia.') The young develop there in closest union with the mother until their various organs are all distinctly formed and they are in condition to take milk from the mammary glands by their own efforts; but even after birth they are tended and protected by the mother. The vast majority of the 10,000 known species of mammals belong in this subclass. It has proved the dominant, the successful type. Australasia is the only land the placentals do not possess, and there geographical barriers have served to protect the marsupials from being crushed by their successful rivals. The classification of Eutheria is not easy to agree upon, but the following outline is that of Parker and Haswell (see CLASSIFICATION OF ANIMALS):

SUBCLASS EUTHERIA.

Section I. *Metatheria.*
  Order Marsupialia—Marsupials.
Section II. *Eutheria Vera*—Higher mammals.
  Order 1. Edentata—Edentates.
  Order 2. Cetacea—Whales, dolphins, etc.
  Order 3. Sirenia—Manatees, dugongs, etc.
  Order 4. Ungulata—Hoofed mammals.
  Order 5. Carnivora—Beasts of prey.
  Order 6. Rodentia—Rodents, or gnawers.
  Order 7. Insectivora—Insectivores.
  Order 8. Chiroptera—Bats.
  Order 9. Primates—Man, apes, and lemurs.

Still more recently (1901), Beddard has published an arrangement which includes certain extinct orders and places them in a succession which is believed to indicate their phylogenetic relationships in a better manner than was possible to his predecessors, as follows: Marsupialia, Edentata, Ganodonta, Ungulata, Sirenia, Cetacea, Carnivora, Creodonta, Rodentia, Tillodontia, Insectivora, Chiroptera, Primates (qq.v.). There is no great difference between these two schemes.

FOSSIL MAMMALIA. Most of the mammalian types of modern times can be traced back to early Tertiary time, but before that period only scattered synthetic or generalized types are known. In the late Paleozoic (Permian) and the earliest Mesozoic (Lower Triassic) rocks are found remains of the so-called Theriodontia and Gomphodontia (see REPTILE), which possess characters remarkably mammalian in expression. These late highly specialized reptiles may be the rootstocks from which the most primitive ancestral forms of mammals of the Triassic and Jurassic were evolved. The mammals of the early Mesozoic were of very small size, not larger than rats, and, as they are known chiefly by their jaws and teeth alone, which are of very primitive type, they can with difficulty be assigned to any of the later groups of the class. Some of these fragmental remains cannot be definitely distinguished as either reptiles or mammals, for their teeth show characters which are possessed by both the anomodont reptiles and the undoubted primitive mammals. Such forms are Microlestes of the European Upper Trias, Tritylodon of the Karoo formation of South Africa, and Stereognathus of the English Lower Jurassic. The principal genera of undoubted prototherian mammals (primitive Monotremata) are Plagiaulax, Bolodon, Ctenacodon, Ptilodus, and Polymastodon. These are known only by small jaws containing sharp incisor teeth, three or four closely set cutting teeth (premolars), of which the fourth is the largest, and the outer edges of which are marked by oblique furrows (see illustration under DUCKBILL), and finally two to four small molars. These molars are multituberculate, and hence the above mentioned genera are grouped in an order called Multituberculata. The other order of prototherian mammals, the modern Monotremata, is separated from the first order by almost the entire space of Tertiary time. One of these creatures, the duckbill, though toothless in its adult state, betrays its origin from a multituberculate ancestor by having in its younger stages of growth broad flat teeth remarkably like those of the Gomphodontia and Multituberculata.

The second subclass of primitive mammals, the Metatheria, comprises a single order, the Marsupialia, and this is divided into two suborders. The more primitive Polyprotodontia are characterized by the presence of four or five incisor teeth in each jaw, and include the majority of Mesozoic mammals of Europe and North America; also the opossums (Didelphidæ), which appeared first in the Laramie (Upper Cretaceous); the carnivorous marsupials (Dasyuridæ) of Australia, which can be traced back only into the Pleistocene; the bandicoots (Peramelidæ) of Australia; and the banded anteaters (Myrmecobidæ), of which no fossil forms have been found. All these are animals of comparatively small size, and they present various adaptations of the marsupial type to particular conditions of existence. The most important Mesozoic genera of Polyprotodontia are Phascalotherium, Amphitherium, Amblotherium, Triconodon, Dryolestes, and Spalacotherium, and several others chiefly from the Upper Jurassic rocks of England and Wyoming. The remaining suborder of Metatheria, the Diprotodontia, is characterized by the presence of two large incisor teeth in each jaw, and its fossil and recent forms are almost wholly confined to Australia. This suborder contains the gigantic Diprotodon, its smaller ally Nototherium, and the peculiar 'pouched lion' of Owen (Thylacoleo), all extinct and found in Pleistocene deposits; also the modern wombats, kangaroos, and phalangers, fossil forms of which have been found in the superficial deposits of Australia and South America.

Among the Eutheria the Edentata, Cetacea, and Sirenia are of uncertain origin. They began with nearly normal eutherian types in the Eocene, and they present through the Tertiary degenerating series of peculiar animals. The Edentata began in the Eocene, and during the Tertiary they developed some odd gigantic beasts—Megatherium, Mylodon, Megalonyx, and Glyptodon (q.v.), the latter with a massive coat of armor plate. From these giant ancestors descended the comparatively small modern sloths, anteaters, and armadillos. The Cetacea is a group of mammals which through degeneration from the normal mammalian type has become peculiarly specialized and adapted to a fish-like habit of life. The earliest form in the Eocene, Zeuglodon, though distinctively fish-like, has, among other characters typical of terrestrial mammals, the carnivorous type of dentition.

The hoofed mammals appear in the lowest Tertiary deposits of North America as forms (suborder Condylarthra) that can with difficulty be distinguished from the earliest carnivores. These early ungulates (typified by Phenacodus from the Lower Eocene of Wyoming) have five useful toes on their plantigrade feet and each toe has a small hoof. The brain is small and slightly convoluted, and the teeth are of a generalized type with low crowns and many tubercles. From the primitive Condylarthra seem to have been evolved all the later and more specialized forms of ungulates. The Perissodactyla comprise the extinct Titanotheroidea, large horned animals of Eocene and Miocene time (see TITANOTHERIUM); Hippoidea, the horses and their Eocene allies the paleotheres (see HORSE, FOSSIL); Tapiroidea, including the tapirs and their extinct Eocene and Miocene allies the Lophiodontidæ; Rhinocerotoidea, the rhinoceroses, with a host of extinct ancestors reaching back into Eocene time; and the Chalicotheroidea, a peculiar group related to both the Perissodactyla and the Edentata. The Amblypoda include five-toed ungulates of large size that lived during Eocene time, of which well-known genera are Coryphodon and Dinocerus. Artiodactyla, or even-toed ungulates, include the modern pigs, hippopotamus, camels, deer, cattle, etc., with long series of forms ancestral to these ranging back through Tertiary time. (See SWINE; CAMEL; HIPPOPOTAMUS; DEER; etc.) Here also belong the extinct families: Anthracotheridæ, large animals of the older Tertiary of North America and Europe; Oreodontidæ of the Miocene and Lower Pliocene of the United States; Anoplotheridæ, medium-sized animals from the Eocene and Lower Miocene of Europe; and the Protoceratidæ of the White River Miocene of America. The ancestors of the modern elephants appear suddenly in the Miocene rocks with all the characters of the suborder well marked. Such evolution as takes place during Tertiary time is manifested in complication of the dentition and in the development of tusks and proboscis. The Toxodontia, Typotheria, and Litopterna are suborders containing peculiar types of ungulates of uncertain affinities found in the Tertiaries of South America; and the Hyracoidea embrace only a few obscure fossil forms. See ELEPHANT; MAMMOTH; MASTODON; etc.

The Carnivora begin in the Eocene with generalized carnivorous types as Creodonta (q.v.) that are easily confounded with the early ungulates; in fact, the Creodonta is considered to be the ancestral group of both the Ungulata and the Carnivora and possibly also of the Ganodonta (primitive edentates) and the Rodentia. Eight families of creodonts are recognized, mostly from the Eocene of Europe and the United States. The more important genera are Arctocyon, Mesonyx, Patriofelis, Hyænodon. Some creodonts found in the Santa Cruz formation (Lower Tertiary) of Patagonia present interesting marsupial features. The true carnivores have larger, more deeply convoluted brains and strong sectorial teeth, with an accentuation of all other carnivore characteristics. The dogs, bears, weasels, civet cats, hyenas, cats, all have ancestral lines extending more or less into the early Tertiary, and some instructive phylogenetic series have been demonstrated. The marine carnivores (Pinnipedia) possibly had their ancestor in the Eocene creodont Patriofelis.

The shrews and moles of Eocene time present less marked differences from their modern descendants than do any other types of mammals. Almost nothing is known of the ancestry of the bats. Among the Rodentia, the characteristic feature in the dentition, namely the chisel-shaped incisor teeth growing from persistent pulps, is seen in fossils from the early Eocene. Such forms are Esthonyx and Tillotherium of North

American deposits. The hares, rabbits, rats, mice, squirrels, and beavers appeared in the Miocene.

The Primates are represented in the Eocene and Miocene beds of North America and Europe by fossil skeletons which combine the characters of the lemurs and apes, and which may be considered as ancestral apes. These are Anaptomorphus, Adapis, and Megaladapis. The true apes appeared in the Middle Miocene of Europe and enjoyed a rapid evolution, for many genera have been found in the Miocene and Pliocene deposits there. They are all closely allied to the modern genera of Europe, Africa, and Asia. Fossil traces of man are very rare.

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MAMMARY GLAND. See Breast; Mammalia.

MAMMARY GLAND, Diseases of. The following are some of the most important of the affections of this gland:

Acute Inflammation of the breast (*mastitis* or *mastodynia*) is characterized by great swelling, tenderness, pain, and fever. There is a knotty feeling in the inflamed part, and pus soon forms; but the abscess is often slow in pointing. The affection may occur at any period of lactation, and sometimes arises from very trifling causes—as loaded state of the bowels, too stimulating a diet, etc. The bowels should at once be cleared out by sharp purgatives; fomentations should be applied; the arm on the affected side should rest in a sling; and an incision should be made to evacuate the pus. The milk should also be regularly drawn off by means of a pump, if it can be done without extreme pain.

Sore nipples are a frequent cause of the preceding disease. Among the remedies for excoriations, cracks, fissures, and ulcerations of the nipple which cause great pain in suckling, are the application of strong astringent lotions (tannin lotion, for example), touching the sore point with solid nitrate of silver (lunar caustic), and especially the application of collodion. In bad cases, a metallic shield must be placed on the nipple, to protect it from the clothes and from the child's mouth. The regular application of a liniment of rectified spirits and olive oil in equal parts will sometimes prevent this affection.

The mammary gland is also liable to hydatid disease, to tumor, cyst, cancer, or galactocele. See Hydatid; Tumor.

MAMMEE APPLE (Haitian *mamey*, the native name), *Mammea Americana.* A highly esteemed fruit of the West Indies (where it is sometimes called the wild apricot) and tropical America, produced by a beautiful tree of the natural order Guttiferæ, 60 to 70 feet high. The fruit is roundish, from the size of a hen's egg to that of a large orange, with a thick, leathery rind, and a very delicate inner rind adhering closely to the pulp, which must be carefully removed on account of its bitter taste. The pulp is firm and bright yellow, with a peculiarly sweet and very agreeable taste, and a pleasant aromatic odor. A similar fruit is produced by an African species, Mammea Africana (called Ochrocarpus Africanus by some botanists). The wood of the mammee apple, which is fine-grained, is very valuable for cabinet-work, and, on account of its durability when exposed to moisture, is highly prized. A liquor is distilled from the flowers, which have been first steeped in spirits of wine. There are about a half dozen species of the genus Mammea, all of them tropical.

MAMMI'TIS (Neo. Lat., from Lat. *mamma*, breast), Mastitis, Garget, or Inflammation of the Udder. The cattle disease ordinarily known as garget is common in well-nourished cows which are heavily fed at the time of calving. It is especially frequent in heavy milkers. In such cows a slight congestion of the udder is normal at calving time. This physiological condition may be aggravated by exposure to cold air or by neglect to milk regularly for a day or two. The udder then becomes very hot and the milk shows clots and streaks of blood. If these symptoms are not relieved, a general fever condition may be established with a cessation of milk secretion and formation of abscesses in one or more quarters of the udder. In treating the disease, the milk should be frequently drawn and the udder should be thoroughly rubbed with some ointment, such as a mixture of vaseline, gum camphor, belladonna, and henbane. Where the udder is very hard, an ointment made of one drachm each of iodine and iodide of potash in four ounces of vaseline may be used. Until recovery takes place the diet should be light, and laxatives, such as Epsom salts, should be administered. Another form of the disease is known as contagious mammitis and is due to infection by a streptococcus. The symptoms are similar to those of garget. Goats are affected by a similar disease known as gangrenous mammitis, which is due to a micrococcus. Treatment of contagious forms of mammitis should consist in injections into the teats of antiseptic solutions. Some veterinarians maintain that in such cases the milk should not be drawn, since the disease may thus be spread by the hands of attendants. Good results have been obtained by thoroughly blistering with biniodide of mercury and cantharides. Tuberculosis of the udder is frequently mistaken for simple garget. Suspected cases should be tested with tuberculin, since the milk of such cows is dangerous.

MAM'MON. An Aramaic word meaning 'riches.' It is employed in two ways in the New Testament: (1) In Luke xvi. 9-11, where it signifies literally riches; and (2) in Matt. vi. 24 (Luke xvi. 13), where it is used for the god of riches. The phrase 'mammon of unrighteousness' also occurs in the Book of Enoch (lxiii. 10) in allusion to Luke xvi. 9. It is not to be concluded, however, that there was a Syrian god named Mammon. The derivation is uncertain, and none of the explanations proffered is satisfactory.

MAMMON, SIR EPICURE. In Jonson's *Alchemist*, a wealthy and arrogant sensualist, whom Subtle drains of his money by arousing his cupidity.

MAMMOTH (from Russ. *mamantŭ*, mammoth, from Tatar *mamma*, earth; so called because the Yakuts and Tungusians believed that the mammoth burrowed like a mole, since its remains were discovered under ground). The woolly elephant (*Elephas primigenius*), the best-known and one of the most recently extinct of fossil elephants, closely related to the existing Asiatic elephant. (See ELEPHANT.) It inhabited Central Europe during Glacial and post-Glacial times. At that time the area of the present North Sea was forested land, and thousands of mammoth teeth and bones have been dredged from the sea by fishermen. It may have originated thereabout and moved eastward, for remains have been found throughout Asia; and it passed on by the then-existing land connection with Alaska into North America, where it spread over the continent as far south as the Central United States. A second, rather doubtful, species (*Elephas Columbianus*) has been named from some large bones found in the Southern States. The distinction between these elephants and the more familiar mastodon (q.v.) must be kept clear: the latter was a very different animal.

Though the enormous bones of these and other fossil elephants, and their almost imperishable teeth, have frequently come to light, ever since the forgotten antiquity when they were hunted by primitive man, and have been the bases of strange tales, theories, and superstitions, little was known about them until the discovery at the close of the eighteenth century of remains entombed in the ice-cliffs of the Siberian coast, where complete animals have been kept in cold storage for unnumbered thousands of years. These and other remains enable us to reconstruct more exactly than in the case of any other fossilized creature the proportions and aspect of this animal. Though the tradition of the marvel which the bones seemed to our forefathers has given to the word 'mammoth' a sense of something huge, this elephant probably did not on the average much exceed in size African elephants of the present day. One of the largest known examples—that preserved by the Chicago Academy of Sciences—did not exceed 13 feet in height at the shoulder, and has tusks 9 feet 8 inches long. African elephant tusks 10 feet 3½ inches long were exhibited in New York in 1900. The largest mammoth tusks ever actually measured, according to Lucas, were two from Alaska, one 12 feet 10 inches long, weighing 190 pounds, and the other 11 feet long, weighing 200 pounds. Modern African elephant tusks of the same size would weigh 20 per cent. more.

HEAD OF A MAMMOTH.

In general form and osseous structure the mammoth resembles the Indian elephant, but the skull differs in the narrower summit, narrower temporal fossæ, and more prolonged bony sheaths supporting the base of the tusks, which were long, comparatively slender, and described a curve both upward and outward. There are great variations in the amount of this curve, from almost straight to a nearly complete spiral, but it is characteristic of the species. Flower says that tusks were doubtless present in both sexes. The molar teeth are peculiar in the great relative breadth of the crown, and the narrowness, close approximation, and thinly enameled walls of their transverse ridges. Outwardly the mammoth differed from any other known elephant in the fact that it was clothed with long hair, and a dense, woolly underfur, in adaptation to the cold climate of its habitat. Compare MASTODON.

From the earliest times fossil ivory was derived from the buried tusks of these elephants. The ancient Chinese worked in it, and even had such ideas about the edibility of the animal's flesh as makes it probable that they knew that carcasses were occasionally found on the Arctic coast. This ivory was known to the Greeks, and the 'licorne' sent as a present by Harun al-Rashid to Charlemagne is believed to be a mammoth's tusk. Arabic writers of the tenth century mention it as an article of regular Russian trade, and ever since that time fossil ivory has come from Siberia at a rate calculated to be not less than 100 pairs of tusks a year.

Among the strange conceptions of the animal which furnished this ivory that arose among people unfamiliar with elephants was that of the Chinese, who said it must be a mole, because its remains were always found under ground. This was not so illogical as the pious hypothesis in Europe that the bones were those of Saint Christopher. The gathering of this antediluvian heritage continues to be a regular business along the Arctic coast. In 1799 one of the ivory-hunters discovered in the cliffs of perpetually frozen earth and ice which border the course of the lower Lena River a shapeless mass which three years later, under the influence of a succession of unusually warm summers, had been released from its tomb and fallen to the foot of the cliff. In March of 1803 the hunter visited it and cut off and carried away the tusks, which he sold for fifty rubles. In 1806 the animal was examined by a scientific man. The Yakuts of the neighborhood had cut off the flesh to feed their dogs, and the wild beasts had almost entirely cleaned the bones. The skeleton was, however, nearly entire, and some of the bones were still held together by ligaments. The head was covered with dry skin, and one of the ears, which was well preserved, was furnished with a tuft of hairs. Three-fourths of the whole skin was procured; it was of a dark gray color, and was covered with a reddish wool, and long black hairs or bristles, forming a long mane on the neck. The entire carcass, together with the recovered tusks, was removed to Saint Petersburg, where it is now preserved. Since that period several other carcasses have been disentombed by melting or floods, but, in spite of strenuous efforts, no valuable parts have been recoverable.

What caused the disappearance of the mammoths has not been satisfactorily explained. To judge by the extraordinary abundance of the remains, this elephant must have been excessively numerous throughout most of its range. It seems fitted to withstand any cold to which there is reason to suppose the species was ever exposed, at any rate in the southerly parts of its range. At its period the present treeless areas of Northern Asia were covered with forests of pine, upon whose leaves and underbrush the elephants were accustomed to feed. The disappearance of these forests would account for the extinction of this and associated extinct animals in that region, but the question as to the rest of the habitat remains unanswered. There is no doubt that in Western Europe, and probably in America, mammoths survived not only the advent of mankind, but even his advancement to the Neolithic stage. Of this a variety of evidence exists, including unmistakable and really excellent etchings made by the 'cave men' of Southern France, some upon pieces of the animal's tusk. That those men, assailing the mammoth in numbers, driving it into inclosures and entrapping it in pitfalls, could overcome it cannot be doubted; and it is probable that in Europe the waning species was finally terminated by human agency.

The relationship of the mammoth to other fossil elephants, and its place in the evolutionary history of its family, will be found treated in the article ELEPHANT, paragraph *Fossil Elephant*.

BIBLIOGRAPHY. See authorities mentioned under ELEPHANT; also Beddard, "Mammalia," vol. x. of *Cambridge Natural History;* Lucas, *Animals of the Past* (New York, 1901).

MAMMOTH CAVE. The largest known cavern in the world, situated in Edmonson County, Ky., near Green River, 125 miles southwest of Lexington. The Mammoth Cave—discovered in 1809 by a hunter named Hutchins—consists really of a series of caverns that have been explored for a distance of many miles. Its mouth is about 600 feet above sea-level. Several streams occur in the cave, the principal one being the Echo River, which has a length of nearly three-quarters of a mile and communicates through an underground passage with Green River. The Styx, about 450 feet long, is remarkable for a natural bridge of great beauty. Passages and avenues connect chambers or halls situated at different levels, thus showing the slow progress of the underground stream in its course through the earth. The largest chamber —named the Chief City—is 450 feet long and 130 feet wide. Several other large chambers or domes extend through the entire height of the levels. The most notable of these domes are the Stella, Mammoth, and Gorin's, each about 250 feet high, and Lucy's Dome, over 300 feet high and 60 feet in diameter. Cleveland Avenue extends for more than two miles, and presents a most wonderful variety of crystals and incrustations. All of the halls offer to view numbers of stalagmites and stalactites, whose varied and contrasting shapes or grotesque resemblances to natural or architectural objects, in conjunction with the streams, lakes, cataracts, and fountains, form the wonderfully picturesque scenery of the cavern. Startling effects are produced by the use of lights and fireworks, the Star Chamber showing on its ceiling myriads of glistening points, from which it takes its name.

The Mammoth Cave is but one of an extensive system of caves occurring over an area of not less than 8000 square miles in Kentucky and Tennessee. The process of formation seems to have been as follows: Rainwater and melted snow more or less charged with carbonic acid gas, and having the power of dissolving limestone, makes its way downward by means of joints and bedding planes in the rocks, and finally comes to the surface again as springs at levels determined by the larger drainage systems of the country. From the surface downward this flowing water dissolves out sink-holes and pipes; in its horizontal progress toward an outlet it carves out the caverns. The gradual lowering of the beds of larger river systems permits lower outlets for these subterranean waters, thus leaving the older galleries dry. The atmosphere of Mammoth Cave varies little from 54° F. the year around. The animal life of the cave consists of a few species of fish and crayfish and several species of insects and bats. See CAVE ANIMALS. Consult Hovey, *Celebrated American Caverns* (Cincinnati, 1882).

MAMMOTH HOT SPRINGS. A group of thermal springs situated in the extreme north of the Yellowstone National Park in northwestern Wyoming. The waters deposit calcium carbonate in the form of travertine, which covers an extent of over a thousand acres. The deposition of this material has built up a series of basins, some of which have a diameter of nearly 100 feet. The hottest spring is 165° Fahrenheit. These springs have no rival in the world since the terraces of Rotomahana in New Zealand were destroyed by a volcanic eruption.

MAMO, mä'mô (Hawaiian name). A peculiar creeper-like bird of the Sandwich Islands (*Drepanis Pacifica*), the only representative of the family Drepanidæ, and now extinct. Its destruction was brought about early in the nineteenth century, "for the sake of its rich yellow feathers used in former days to decorate the state robes of the chiefs." Very few skins are in existence, and these are preserved in European museums. After the extinction of this bird resort was had to another, the oö or moho (q.v.), to supply yellow feathers, while red feathers for the purpose were obtained from the scarlet creeper (*Vestiaria coccinea*). Consult Wilson and Evans, *Birds of the Sandwich Islands* (London, 1884). See Moho.

MAMORÉ, mä'mô-rā'. A river of Bolivia and the principal headstream of the Madeira, being by many geographers considered as the upper course of that river (Map: Bolivia, D 6). It rises on the eastern slope of the Cordillera Real, 20 miles northwest of Sucre, and flows first eastward under the name of Rio Grande, then northwest and finally northward, receiving from the right its main tributary, the Guaporé, after which it forms the boundary between Brazil and Bolivia until it unites with the Beni to form the Madeira. After leaving the mountains it flows partly through extensive grazing plains, partly through immense forests. Its course is throughout so swift that even in the forest region it is continually shifting its bed. The length of the Mamoré is over 1300 miles, and it is navigable for nearly 1000 miles. Most of its tributaries are also navigable after they leave the mountains and enter the great plains. The river is, however, obstructed by falls and rapids, especially those of Guajara, 40 miles above the junction with the Beni, and by dams of fallen logs, so that it is navigable practically over a continuous stretch of only about 400 miles above the Falls of Guajara.

MAM'PALON, or **MAMPELON** (from the native name). A semi-aquatic civet-like animal (*Cynogale Bennetti*) of the Malayan region, which feeds upon fish, crustaceans, and the like, and has many curiously otter-like ways and adaptations. It is a member of the family Viverridæ, related to the hemigales and paradoxures.

MAMUN, mȧ-mōōn'. A distinguished caliph of the Abbasside line, son of Harun al-Rashid. See Al-Mamun.

MAN, Science of. Especially during the later half of the nineteenth century and the opening years of the twentieth, scientific methods were extended to the study of man in various aspects, and a series of special sciences relating to different attributes or characters of the human being grew up. Among these are physiology, craniology, psychology, archæology, sociology, demology, ethnology, and various subdivisions of these, as well as several broader sciences dealing with common attributes of mankind and lower organisms, such as morphology, embryology, ecology, etc. By some writers the several branches of knowledge dealing specifically with the human kind are treated as coördinate and more or less distinct, and by some of these anthropology is applied, as one of the series of coördinate terms, to the science of the human body or somatology. Other writers employ the term anthropology in a more general sense, including within its scope the special sciences dealing not merely with the human genus, but with men and their works in all their multifarious aspects; and this usage is to be preferred both on logical grounds and in the interests of convenience. Accordingly the science (or sciences) of man may be defined as equivalent to anthropology in the broad sense, i.e. as including the various branches of definite knowledge pertaining to mankind.

In a broad sense, anthropology may be defined as the science of (1) the human organism; (2) the human mind; and (3) the human activities and their products; and these categories correspond respectively with the sciences of (1) somatology; (2) psychology; and (3) demonology. These branches of knowledge are themselves complex. Somatology comprises human anatomy, physiology (and pathology, etiology, etc.), craniology, embryology, and ecology, in addition to anthropometry, craniometry, medicine, surgery, constructive hygiene, and other collateral branches; psychology comprises phrenology (of course in the sense of observational knowledge concerning cerebral structure and functions), neurology, etc., together with such collaterals as psychometry, both introspective and experimental psychology, and the inchoate systems of cerebral cultivation sometimes called psychurgy; while demology is more definitely organized as (a) esthetology, or the science of arts; (b) technology, or the science of industries; (c) sociology, or the science of laws; (d) philology, or the science of languages; and (e) sophiology, or the science of ideas—the last comprising mythology, theology (in certain aspects), philosophy, teleology, and other more or less interrelated systems of thought. There remain certain sciences dealing with special aspects of the field covered by these divisions; thus, ethnology is the special aspect of anthropology pertaining to racial characters and types, while archæology deals with the prehistoric aspects of somatology, esthetology, and technology so far as these are known through relics. So, also, several of the sciences have commonly recognized descriptive aspects, such as craniography, demography, ethnography, etc. The leading divisions and branches of the science are shown in the accompanying table:

Anthropology	Somatology	Anatomy Physiology	Anthropometry
		Craniology	Craniometry
		Embryology Ecology, etc.	
	Psychology	Phrenology Neurology, etc.	Psychometry, etc.
	Demonology	Esthetology Technology	Archæology
		Sociology Philology	
		Sophiology	Mythology Theology Philosophy Teleology, etc.

Manifestly anthropology as thus defined cannot be treated in detail within moderate limits. Accordingly somatology may be passed over with little more than mere reference to the treatment of its subdivisions elsewhere; while psychology (q.v.) is also treated elsewhere, and needs no special consideration herein beyond constant emphasis of the facts that man is *the* psychic organism of the known universe, and that his distinctive attributes as a creature and more especially as a creator of natural interactions grow out of his essentially unique possession of mentality. Even demology, with its subsciences, is not easily treated in brief space, since each group of the human activities forms a field of no less extent than that of any of the older sciences; but it may suffice to outline the science and its subdivisions in terms of that trend of development brought out by a general survey of the human realm.

CLASSES OF MANKIND. The genus *Homo* of Linnæus comprised two species, *Homo sapiens* and *Homo monstrosus*, the former including several varieties or races and the latter certain peoples supposed to have been modified by local conditions or habits. The varieties of *Homo sapiens* have been much discussed, and many systems of classification have been proposed; in the most practical the varieties are denoted and described as (1) the Caucasian or White race, (2) the Mongolian or Yellow race, (3) the Malayan or Brown race, (4) the Amerind or Red race, and (5) the African or Black race. This arrangement is open to objections of which the most serious grow out of the existence of aberrant or intermediate forms; and to meet these, more elaborate classifications, including greatly increased numbers of races, have been proposed. (Typical classifications of races are given in the article ETHNOLOGY.)

Another mode of defining and classifying mankind rests on psychic rather than physical characteristics. By it peoples are grouped according to habitual conduct, or, in the last analysis, according to habitual thought as inferred from conduct; and, while the grouping may rest on any or all of the activities, that commonly employed expresses the social activities. Arranged in this way all known peoples fall into the classes of (1) savagery, in which the laws are based on consanguinity traced in the female line; (2) barbarism, or patriarchy, in which the social laws rest on real or assumed consanguinity reckoned in the male line; (3) civilization, in which laws and institutions rest on property right, especially in land; and (4) enlightenment, in which the laws are based on the right of the individual to life, liberty, and the pursuit of happiness. This system of classifying mankind is no more free from difficulties than that based on physical characters; yet it has the merit of increasing value with the multiplying interactions of peoples as against the diminishing accuracy and utility of the classification by race, and also the special merit of expressing the normal trend of development in the human realm.

THE COURSE OF HUMAN DEVELOPMENT. The fundamental fact that human generations are not closed cycles, but that each springs from the culminating portion of the last, cannot be too strongly emphasized; it follows that human development is progressive. While it would be premature to attempt final analysis of the elements in this progression, it is easy to trace the general course, which lies in the direction of increasing mentality. A similar tendency seems to affect animal and vegetable life, and may pervade all nature; yet it is so especially characteristic of the human realm as first to distinguish man from lower animals, and then to afford a basis for classifying mankind.

While the dominant factor of human progress is mentality, the psychic forces must interact with the physical forces concerned in bodily growth and heredity and progressively shape both functions and organs; so that, e.g. cranial capacity increases and prognathism decreases from the lower races to the higher and from primitive culture to enlightenment.

In the domain of mind the progressive tendency is conspicuous. Gallatin and Turner were led to the study of aboriginal languages largely as indices to primitive minds, which seemed to them unlike those of their own fellows; Tylor's conclusions as to primitive belief imply constant differences between the mental operations of tribesmen and those of peoples living in organized nations; Powell perceived that while the minds of primitive men differ from those of advanced men there are striking coincidences in the mentality of unrelated tribes, and was thereby led to the classification of peoples by stages of culture; Brinton pursued the inquiry with special reference to coincidences of belief among unrelated peoples, and was led to a conception of the unity of mind; while McGee extended the observations and summed them up in a law of the responsivity of mind (foreshadowed by Bacon in the first Aphorism of the *Novum Organum*), in which the mind becomes a more or less perfect mirror of external nature, and knowledge merely an integration of experience with such reflections as earlier experiences may have produced.

These successive generalizations are accordant, and the last agrees with the common observation that in any human group experiences accumulate in such manner that the possession of each generation is greater than that of the last. This accumulation is itself cumulative with increasing capacity, and operates through a specific process, of which the distinctive feature resides in the fact that it involves no loss, but constant gain. In the physical realm any mass or velocity conveyed from one body to another is lost to the first body when gained by the second, but in the realm of mentality the transmission of knowledge from one individual to another involves no loss to the giver, however great the gain to the receiver. It follows that human knowledge is influenced by contact with individuals and groups, its aggregate increasing in a geometric ratio; also that mental acquisitions once made are seldom lost, though often assimilated in complexer combinations in which original features may not be recognizable; and, furthermore, that those groups of mankind possessing the greater capacity or the larger accumulation of experiences think the more congruously with both external nature and human character, i.e. their mental operations are the more just and the more humane.

The demotic classification of mankind, or the definition by culture-grades, is an application of the principle of cumulation of knowledge, itself a corollary of the law of mental responsivity. Savagery is but the stage of extreme provincialism in which thought and fellow-feeling are limited to the family group and the local range, and in which (at least initially) the only knowledge of relationship is that based on the ocular evidence of maternity; while local animals may be deemed more closely akin to the group than alien men, and fire, certain plants, and even inorganic objects are thought to possess human attributes and may be regarded as belonging to the family. So, too, barbarism is a stage of less extreme provincialism in which knowledge and sympathy extend to the tribe and its range, and perhaps to confederated tribes; through increasing knowledge paternity is recognized and becomes the basis of a relationship from which natural objects are eliminated, though zoic tutelaries are retained; and through motives of growing humanity, modes of adopting aliens arise. Civilization arises with knowledge of neighboring regions and peoples and with recognition of the territorial rights of neighbors, and the stage is characterized by that fellow-feeling and mutual confidence on which civic organization necessarily rests. Enlightenment was merely the natural and necessary outgrowth of advancing knowledge with its concomitants of justice and humanity; the transition proceeding through political or social revolution. In accordance with the principle of cumulation, the later advances have been more rapid than the earlier; and it is through the same principle that peoples and races are constantly assimilating, and that primitive folk of sufficient vitality to maintain a strenuous existence are steadily rising to civilization and enlightenment.

Nor does the social advancement stand alone, for the chief stages of human development are definable no less clearly in terms of other activities. In the field of arts the initial efforts are mimetic, the objects most frequently imitated naturally being those self-active things which easiest hold attention; later the mimicry grows into symbolism stimulated and guided by current beliefs clustering about swift or strong self-motile creatures; then follows conventionalism, in which artistic concepts are largely controlled by arbitrary devices; while the highest stage is that of idealization, culminating in the expression of concepts by devices so simplified as to convey the similitude of reality. Similarly primitive industries are imitative of the actions of creatures respected or feared by reason of strength, swiftness, or cunning; later the industrial operations are largely guided by divination and custom; the third stage opens when the possession of conscious knowledge enables the worker to verify novel observations and seize chance opportunities; while the final stage is that of invention, in which experiences are combined as a basis for provision. In language the initial efforts direct or attract attention by means of vocal signals, and later these are multiplied by means of inflectional and other mutations tending to cluster about radicals; then follows the stage of arbitrary conventions fixed by writing and printing, which is succeeded by the interchange and purposive assimilation of linguistic elements naturally attending the increasing contacts and growing originality of later times. The domain of ideas is at first nearly barren, since human mentality remains dominated by primal animality, yet thought gathers about beasts and other fearsome objects to form the crude zoistic systems found among all adequately studied savages; later the nuclei of thought multiply but retain the form of beliefs, ranging from zoism and pantheism to inchoate monotheism; still later theistic concepts are refined and spiritualized and gradually put in the background of cosmogony, while explanations of phenomena are sought in natural laws; and finally conscious thought rises above the mechanical conditions controlling primitive life and guides action in the light of accumulated knowledge toward predetermined ends.

In the several lines of activity the later advances are well known through modern history; it is the earlier stages that are of special interest to the anthropologist, and these are outlined in later paragraphs. The stages in each line overlap, and those in different lines do not exactly coincide, sometimes one and sometimes another leading; yet the general succession fairly represents the course of human development. Denoting each stage in each line by a single term expressing its salient character, the sequence is shown in the accompanying table:

ACTIVITIES	First stage	Second stage	Third stage	Fourth stage
Arts	Mimicry	Symbolism	Conventionalism	Idealization
Industries	Imitation	Divination	Verification	Invention
Laws	Maternalism	Patriarchy	Civilization	Enlightenment
Languages	Demonstration	Association	Conservation	Integration
Ideas	Zoism	Polytheism	Taxis	Telesis

ESTHETOLOGY: ARTS, OR SPONTANEOUS ACTIVITIES. In the absence of a satisfactory term to denote the more spontaneous activities of mankind, the customary designation of a portion of these may be extended to all; and when so applied the term arts may be defined as including the fine arts (painting, sculpture, music, the drama, etc.) and also play, sports, games, and other manifestations of enjoyment and recreation, but not the industrial arts.

There is some diversity of opinion as to the logical order of the activities, the position of the arts being especially questioned. Thus Herbert Spencer adopted the 'surplus-energy theory,' i.e. the view that in the pleasurable and recreative activities any surplus energy not required for immediate welfare escapes along lines related to those of habitual exercise; in this view the arts would become subordinate to and largely dependent on the industrial and other serious activities. Karl Groos and J. Mark Baldwin, on the other hand, contend that play is prophetic of the occupations of later life; and in this view the arts would seem to lie at the threshold of human action and form a prelude to industries, laws, languages, and practical ideas. Groos's marshaling of the facts is convincing; yet it remains true that while playful acts may be prophetic so far as the individual or group is concerned, the lines of action are determined by habit and bodily function and even organic structure, themselves the product of ancestral exercise; so that in the last analysis play and its correlatives must be regarded as both the prophecy and the fulfillment of faculty.

The simple and aimless play of individuals and groups is common to man and various lower animals, and need not be considered in detail; though it is to be noted that play is commonly mimetic, and also that the play instinct is an ever-welling source of action whence the less spontaneous activities flow.

Organized plays become games. The games of lower culture are by no means random outgrowths, but are suggested and controlled by fixed regulations. Thus, various Amerind tribes are devoted to foot-racing; yet the races are not tests of swiftness so much as divinatory or invocatory acts designed to appeal to tutelaries, and are usually set by seasons for planting or harvesting or hunting. In the Papago tribe of Arizona and Sonora the racer drives a ball, which is caught on the foot and thrown forward, and thus kept in constant motion; actually the game affords a severe test of swiftness, endurance, and skill, yet it is regarded as a ceremonial contest for the favor of tutelaries. In the Tarahumari tribe of Mexico a similar game is played as an invocation for success in hunting, and in both tribes there are corresponding races for females, which are run as a special invocation for fertility. Dances also are ceremonial observances connected with invocation or thanksgiving; the performers are in ceremonial costume: they wear anklets of strung deer-hoofs designed to simulate the clicking of the hoofs of an animal walking over rocks, carry rattles (of gourds partly filled with dry seeds) to imitate the sounds made by reptiles or other creatures, and wear head-dresses of deer-horns or fox-scalps or eagle-feathers as symbols of and invocations to the Ancients of those animals recognized as tutelaries. Primitive peoples are more given to games of chance than of skill. Among the Iroquoian tribes a dice game is played with plum-stones in a wooden dish, and the gamesters sit for hours or days, staking and perhaps losing their possessions even to the garments from their backs, and in olden times their wives. Similar games prevailed among the California tribes, and native tradition has it that of old mortal enmities were wiped out on the chance of a die, as when the loser stood up as a voluntary victim of the winner's war-club. Although mere games of chance, yet to both Eastern and Western tribesmen these were tests of the favor or power of deities, and the outcome was deemed the ultimatum of the fates. Among many primitive peoples an elaborate game was played with a ring or hoop (with the aperture sometimes reduced by a net) used in connection with a staff or arrow; the play consisting in attempts to thrust or throw the staff or arrow through the ring as it rolled across the gaming plaza. Among Amerind tribes this game was originally divinatory and of esoteric meaning connected with fertility; it passed into higher culture through development along several lines, one leading to the ring-and-spear game of the modern tournament, and another leading to racquet and its variants. A still more important type, both in aboriginal form and in modern development, is the arrow game investigated by Cushing and Tylor and more recently by Culin. Germs of the game found among Amerind tribes are ceremonial and sortilegic, as among the Pueblo peoples, where arrows were cast toward the four quarters as invocations to the powers, and in the Huichol tribe, of Mexico, where arrows were discharged ceremonially in groups of two or four in the search for a sacred plant used as a stimulant. In the primal ceremony the pieces are finished products of the arrow-maker's skill, and the parts are marked with appropriate emblems (e.g. the point for mandible or beak, the shaft for neck or body, the feathering for wings, and the nock for feet, of an avian tutelary); in the developed game billets of wood may be substituted for arrows, but they bear the symbolic markings. This game is of much interest as the parent stock whence many modern games have sprung. In Korea it is played with billets much broadened and flattened, though retaining the emblematic markings; in China and Japan the billets are of ivory or board, while the emblems are somewhat modified; in India and Arabia further steps in development are shown; and in Europe the pieces are cards with esoteric emblems directly traceable to the archaic arrow game.

In primitive life gaming is involved with music and graphic art. The Australian natives tie a thin and slightly curved billet of wood to the end of a cord attached to a handle as a whip to the stock, and by whirling it through the air produce a lugubrious wail; this is used ceremonially as an invocation, and efficiency is imputed to it in proportion to the volume and weirdness of the sound; it appears to represent an avian tutelary, and to form the prototype of the boomerang. Certain Amerind tribes possess a related device, though its use in America seems decadent. Several California tribes use in their divinatory ceremonies a prototype of the drum, consisting merely of an upright log beaten rhythmically with a war-club or staff; when installed for the purpose, a hollow log is chosen. Practically the beating is a signal for the tribesmen to gather, though putatively it gives notice to tutelaries that a ceremony in their honor is in progress; and the rhythmic sound is conceived to represent mighty footfalls. The woodland tribes use a stick rattle (i.e. a notched stick of hard wood over which a smaller dry stick is drawn to produce a rasping sound) and the plains tribes a gourd-and-seed rattle in rude harmony with the drum, to symbolize the sound of the movements of the tutelary whose footfalls are marked by the drum-beats, and incidentally to deepen the naïve illusion of the auditors that the powers are present. The stick rattle played a leading rôle in the development of instrumental music; traced along one line it passed into the musical bow (which in Mexico and elsewhere was combined with the gourd) and then through the enlargement and hollowing of the wood into various Oriental types, and eventually into the violin. The gourd and deer-hoof rattles also underwent successive modifications in which the original form and emblemism were lost. Another early type of instrument is the horn or trumpet; its distribution in the manifestly primal form and certain analogies indicate that it was first used in Eurasia to symbolize the voices of kine while still they were regarded as tutelaries. Among certain coastwise tribes sea-shells (especially the conch) were similarly used. The substitution of metal for the bovine horn began with the Bronze Age in the Old World, though the original type persists wherever horned cattle exist; while most of the variants were developed during the historical period. The flute arose in regions of bamboo or cane, and vestiges in European and American lore and in Egyptian and Grecian mythology connect it with plant cults. There are some indications that the human voice may have antedated the mechanical device as a source of music. The primitive vocal renditions are ceremonial wailings of invocatory or deprecatory character; thus the Australian natives manifest little individual grief over the death of a clan-fellow, but at intervals chosen members of the group wail in rude concert; in the Seri tribe the death of a matron is mourned by repeated nocturnal wailings; and numerous primitive tribes maintain classes of mourners to placate the manes or otherwise appeal to the powers by grewsome renditions in concert. In Eastern Mexico vocalization accompanies the divinatory dances and games, the performers chanting or singing in a falsetto voice simulating the language of the tutelaries; among the Eskimo the angekok (or 'medicine man') communes with his nature deities in a broken falsetto speech or chant, perhaps in archaic terms. The falsetto chant throws light on the mortuary wailing; in both the voice is changed in order the better to reach the comprehension and favor of the mystical potencies. The primitive renditions may be far from musical, indeed are sometimes purposely discordant; yet under the mimetic instinct there is a tendency toward harmonious attunement which is strengthened when voices and instruments are used in concert. In the development of music, the initial stage is that of rhythm, usually expressed by drum and rattle; in the next instrumental and vocal rhythms are so superposed as to produce melody; the third stage is that of melodious instruments and voices and the combination of melodies in harmony; while the final stage is the modern one of blending harmonies in symphony or antiphony.

Both the gaming devices and the musical instruments of primitive men commonly bear emblematic markings designed to connote and invoke the tutelaries to which the devices are consecrated; though incidentally they may serve to identify the objects with their human owners or custodians. Similar emblematic devices occur on other artifacts; the stone axe of Mexico and the tomahawk and calumet of the Northern Amerinds bear animal symbols; among the Eskimo emblematic inscriptions abound on weapons and implements and reveal a real artistic sense; among the plains tribes inscriptions on skins and bark are common, some of these being emblematic and others historical or calendric, and thus forming the germ of writing. In like manner primitive tribesmen are given to markings on trees, rocks, and other natural objects; these may be range records, yet are commonly totemic, while the petroglyphs of treeless regions may also record episodes of tribal or family interest (capture of quarry, victorious battle, etc.). The petroglyphs are strikingly similar wherever found; those of Arizona, Chile, Australia, and Africa represent human figures or hands and animal forms on like scales and in similarly battered lines supplemented by simple paints, so that the glyphic groups are almost indistinguishable save by the totems of local animals. Related graphic devices are those of face-painting, tattooing, and scarification. In the Seri tribe face-painting is confined to females, who are deemed the sole blood-carriers for the clans; and it is the solemn duty of each matron (particularly the Elderwoman, i.e. the seeress and vicar of the tutelary) to see that the daughters and girl children of the clan are properly emblazoned, and that the paint is promptly renewed when worn off or washed away. The devices are emblems of the respective clan tutelaries—Gray Pelican, Red Pelican (a mythical bird), Green Turtle, Rattlesnake, etc. According to the lights of the lowly believers, the figures are perpetual invocations to the highest potencies recognized by the tribe; and the original application, and in some measure each renewal, is a sacrament. Yet the patterns and colors are not absolutely fixed, some latitude being permitted, especially to the nubile maiden or to the young matron for herself and her first girl child; and in this way spontaneity arises and æsthetic faculty develops. Among many tribes the painting extends to males and to the body, and early in patriarchy the devices are especially allotted to warriors and largely denied to women, who in that stage tend to become chattels or slaves. Still higher in culture the emblems are introduced in costumery or emblazoned on shields, through which the art matures in heraldry. In various regions the primitive face-painting is supplemented by tattooing. Various tribesmen tattoo their totemic symbol on the breast as a shield or on the arm as a token of strength; and some aborigines of Eastern North America tattooed invocative symbols on the back as a protection against unseen enemies, while they relied on their own prowess to repulse the foe in front. In the elaborate tattooing of the Maori in New Zealand and of various Pacific islanders there are clear indications that the devices were primarily totemic and akin in purpose to those of the American aborigines, with a wider latitude for individual taste. Closely related to tattooing is scarification of the body and limbs. In the Mandan tribe of the Missouri, permanent scars were produced in the terrible torture attending initiation into the warrior class, and thenceforward stood as tangible insignia of courage and fortitude; among the Papago the legs of youths were scarred longitudinally in mimicry of thorn scratches, first (through the inverted reasoning of primitive thought) to give them speed and endurance in footracing, and then to remain as evidence of these qualities. It may be questionable whether personal emblazonment preceded emblematic inscription on artifacts (as the example of the Seri would indicate), or whether in certain districts the inscription of emblems prepared the way for face-painting and tattooing; the essential facts are that both were ceremonial and collective, and that spontaneity and individuality were introduced slowly as the arts advanced and extended to the ever-multiplying possessions of advancing culture—the sacramental decoration of basketry, the emblematic embellishment of pottery, the symbolic ornamentation of woven fabrics, etc., which merged with the conventions of early historical times and thus opened the way for arbitrary characters on the one hand and for the free idealization of modern art on the other.

In primitive life concepts of color and form were long symbolic. Among the Pueblo tribes, as shown by Cushing, colors were coördinated with the points of the compass in a Cult of the Quarters, were adored or worshiped in the divinatory ceremonies, and were thereby not merely memorized, but woven into the very fibre of habitual thought; so that when used in painting and in the planting of sacred seeds they were used as invocations to powers believed to control the destinies of men. Initially the assignment of colors was mimetic, as when dawn-color was assigned to the East, sunset-color to the West, sun-color to the South, and cold-color to the North; yet the connotation soon passed into arbitrary symbolism, as when a mixed or all-color was required for the Middle of primitive thought, and especially when sky-color for the Zenith and earth-color for the Nadir were added with the increasing grasp of directional relations. The strength of the Cult of the Quarters and the devotion of its adherents are strikingly shown by the infinite pains taken in the production of the colors; as when corn was cultivated by Amerind tribes through many generations to produce white, yellow, red, blue, and mixed grains (sometimes in patterns on the ear) for ceremonial use. In higher culture the color symbolism disappears, yet the conventions persist in class costumes, uniforms, etc., especially among Oriental peoples; among the Aryans the conventionalism was early dissolved in that artistic progress culminating in Italian art. The primal concepts of form were also interwoven with the Cult of the Quarters; for the placement of arrows or other objects in adoration of the directions produced quadruplicate figures to which a mystical potency or sacred meaning was attached, i.e. they become (like the animal designs) permanent invocations to the powers. Such figures are, or have been, nearly universal; in the form of the simple cross and the swastika they abound among the prehistoric relics of most of the world, and are found among primitive peoples still surviving on every continent save Australia (where the number concept remained binary); standing at first for directional invocations, the quatern figure gradually became a general world emblem, a token of completeness or perfection, a symbol of the Four Winds, and, as refined beliefs arose, a sign of the spiritual world.

A survey of primitive games and music renders it clear that most of the movements and utterances of the performers mimic those of animals, or those imputed to the Great Ancients regarded as the ancestors of beasts and men; for the folk held themselves akin to animals and inhabitants of a realm of beastly powers which demanded placation as the price of human life. Most of the placatory observances are designed to affect the group as well as the individual, so that they are essentially public and collective; and as they grow into regulated ceremonies the germ of the drama arises: symbolic costumes are adopted, emblems of function or power are introduced, the voices of the actors are changed and musical instruments are employed as adjuncts, while idealized scenes are enacted with a scrupulous regard for the recognized proprieties, and eventually a strong dramatic sense is engendered. At first mere vicars of their tutelaries, the leaders in the ceremonies gradually introduce illusive features reflecting their own skill or originality, as in a corn ceremony of the Hopi tribe in which the mythical Great Serpent—arch-enemy of corn and men—is represented by a structure manipulated by a shaman behind the altar while his feet remain in sight of the spectators. Although the steps are too many for recounting, such primitive ceremonies grade into the drama proper; on one line they pass into effigy-plays, such as the sacred puppet ceremonies of the Javanese and the modern European marionettes; along the main line they merge into histrionic performances which are long held sacred, but gradually become secular; while other lines are interwoven with those of both music and graphic arts, and also with the lore which matures in poetry and romance. The latter lines are long; it may be noted merely that the songs and stories and symbols of the primitive ceremonies are the most imaginative productions of the participants; that in consonance with the measure of drum and rattle the renditions are gradually reduced to rhythm; that with recognition of harmony prosodic measure arises; and that with each advance growing poetic spirit finds alternative expression in freer dramatic action and in richer word-painting of story-tellers and scribes, balladists and authors.

In general, the development of the arts (including play and games as well as music, graphics, painting and sculpture, and the drama) indicates a progressive advance from lower savagery upward at a geometrically increasing rate. The growth (or ontogeny) of individual arts measurably epitomizes the development (or phylogeny) of kinds or species, while the occasional recurrence of primitive characters establishes the general sequence and aids in tracing minor lines; at the same time the phylogeny of the æsthetic differs from that of the merely vital in that it looks forward into the future rather than backward into the past—it is, as Groos would have it for the simplest expressions, prophetic rather than vestigial. And every step from the bald mimicry of the prime through the crude symbolism and sluggish conventionalism of the middle course and thence to the free idealization of the present day, the lighter and more spontaneous activities have fertilized and inspired the more substantial activities—they have served as the mainspring of human life.

TECHNOLOGY: INDUSTRIES, OR MATERIAL ACTIVITIES. Man touches lower nature chiefly through material activities. The activities involved in conservation of kind pertain to (1) sustentation, (2) reproduction, and (3) preservation, all of which are shared with lower animals; and among mankind the preservative activities are differentiated into (a) propugnation, or active defense of weaklings and others, (b) domiciliation, and (c) habilimentation. Closely related to these activities are others which may collectively be called coördination, since it is through them that men first fixed their interrelations with plants and animals, as well as fire and various materials. Other material activities are connected with the conquest of the mineral realm through stone-working, metallurgy, etc., and represent the reconstruction of lower nature; while a fourth major group includes those activities connected with transportation, through which man controls space and time. There remain certain activities which may be classed as material though allied to those of intellectual character; these pertain to education, including the exercise and training of mind and body in such wise as continually to widen the chasm between man and lower nature, and serve especially to elevate the activities of conservation into the distinctively human realm. Arranged tabularly the groups are as follows:

- Conservation
  - Sustentation
  - Reproduction
  - Preservation
    - Propugnation
    - Domiciliation
    - Habilimentation
- Coördination
- Reconstruction
- Transportation
- Education

The material activities, like the spontaneous, form a genetic series indicating the trend of human development; they are most easily summarized in terms of this natural sequence, though their number and diversity are such as to forbid treatment of the series save at a few points in the earlier stages.

SUSTENTATION. The primal modes of sustentation were clearly analogous to those of the more omnivorous lower animals; for while archæology yields no conclusive evidence of fireless man, certain living peoples have been found to use this agency in an incidental rather than essential way. Thus the Australian and Tasmanian aborigines consumed raw food so commonly as to indicate that cooking was but a partially acquired art, and the same may be said of the African Pygmies; while the Seri tribe subsist chiefly on uncooked food, and regard fire as an animate tutelary to be employed ceremonially rather than industrially. This tribe, like some of the Australian natives, well exemplifies the habits and modes of thought of peoples not yet in full command of fire, and hence suggests the characteristics of the human prototype. The food habits are strikingly like those of lower animals; after gorging on quarry or carrion or cactus fruits in season, the tribesmen lie about sluggishly until spurred by sheer hunger to search for another supply; there is no knife sense, while the few crude implements are actual or symbolized animal organs; and there is a strong repugnance to the taking of quarry with artificial devices. With the habitual use of fire an increasing variety of foods is consumed; this fact, as well as the chemistry of cooking, indicates that the conquest of fire had much to do with the omnivorous character of the human animal; yet a potent reason for the simplicity of primitive diet is found in the fact that the food habits are largely modeled after those of tutelary animals through the influence of devotional systems fostered by that mimetic instinct which marks budding intelligence. In scores of known tribes the food-quest is a sacrament inaugurated by ceremonial invocations, pursued with concentrated intensity, and terminated with oblations followed by ceremonial feasting in which the qualities of the quarry are supposed to be transferred to the feasters. The Cherokee hunter ceremoniously placated the Ancient deer kind before setting out on a deer-hunt, the Iroquoian Nimrod made a propitiatory address to the bear before giving the fatal stroke, the Zuñi youth dared not even let fly his arrow at a rabbit without a prayer, while the Papago and other Amerind tribes denoted diseases by the names of animals and imputed them to the vengeance of those animals for neglect of due devotions. These customs throw light on primitive warfare, with its concomitants of cannibalism, trophy-wearing, etc. In lower savagery there is a strong race sense and fellow feeling is restricted to the clan or tribe, while aliens are viewed with aversion as peculiarly potent antagonists; so that primitive warfare becomes a form of chase, inaugurated with ceremonies growing into the war-dance, pursued in an exaltation passing into insane obsession, and terminated by observances designed to endow the victor with the valor and cunning and fortitude of the vanquished—these sometimes including cannibalism, and the preservation of his fingers, teeth, head, scalp, or tutelary symbols, as permanent invocations for his powers. The scalp-taking of various Amerind tribes, the aboriginal head-hunting in the Philippine Islands, the preservation of shrunken human heads in South America and the Caribbean Islands, the wearing of necklaces of fingers and teeth, and the prehistoric use of amulets made from bits of skull, exemplify the savage motives.

REPRODUCTION AND PRESERVATION. Human reproduction and propugnation are dominated by social regulations, and form the basis of the institutional activities; while domiciliation is a fruitful branch of industrial development. Primitive house types depend on the materials, climate, and other conditions of local environment, and hence are widely diverse. The simplest known forms are mere bowers of bushes or branches, little different from those of simians; these grade into more commodious habitations, running from the temporary bower to wattled structures, houses of thatched grass, bark and mat covered wigwams, log stockades and cabins, skin tepees and tents, earth lodges, cajon or pisé structures, adobe and rubble pueblos, as well as brick, stone, stucco, and wooden houses. The constructional details and the modes of transition from type to type are innumerable, but the dominant motives in primitive culture are simple. Throughout, the construction is regulated by observances or elaborate ceremonies, which serve practically to crystallize types and methods; the enterprise is launched with invocations, the elders of the clan or tribe are consulted, and as the domicile approaches completion, household gods are convoked and enshrined by fasting and feasting and other devotional exercises. Thenceforward each member of the family has a fixed place in the abode, and due provision is made for hospitable entertainment; and the home passes through a cycle fixed by definite custom, often ending in deliberate abandonment or destruction on the death of owner or occupant. In some tribes, like those of Alaska, the domiciliary customs are complemented by the erection of totemic insignia; and in wandering tribes like the Eskimo, the tutelary effigies may become portable and follow the family migrations. In more advanced culture, pueblos and towns are founded with related observances. Both prehistoric relics and modern examples attest the existence of troglodytes or cave-dwellers, and there are some indications that in certain districts primal men lived permanently in natural niches or rock houses of cliffs, or even in deeper caverns; but these indications are offset by the arboreal habits of both the lowest known tribes and the higher simians, no less than by the course of evolution in motive exemplified by well-studied peoples; on the whole it seems probable that cave-dwelling was not primal, but secondary, and perhaps consequent on changes of habitat.

While the house-building of the higher quadrumana grades into that of lower savagery, habilimentation forms one of the clearest distinctions between man and the lower animals; for not only are all mankind more or less clothed artificially and all beasts unclothed save by nature, but the human habit is manifestly correlated with important structural characters. Without going into full analysis of functions, it may be said that the dermal appendages of lower animals (hair, fur, and wool of mammals, feathers of birds, scales of fishes and reptiles, etc.) are primarily protective and only incidentally æsthetic or decorative, but that the human hair is primarily æsthetic and only incidentally protective. Among the Seri both women and men glory in their hair, which is luxuriant and worn long and loose; it is scrupulously tended and the combings and stray hairs are preserved and worked into necklaces and belts, or interwoven with feather robes or with native cotton or animal skins with the hair on to form simple garments. Among the Brazilians mantles associated with hair in tribal thought are worn on occasion, and also a germ of permanent garmenture (the *uluri*, or primal breech-cloth) worn partly for protection, but for display rather than concealment of the person. Scores of tribes inhabiting various parts of the world exemplify a slightly advanced stage in the development of clothing; the scalps or pelts of animals, often with horns or other organs attached, are worn in ceremonies or on the chase or war-path; these are believed to invest the wearers with the qualities of the animals and serve as permanent invocations to the zoic powers, yet after the initial consecration the insignia may be worn for comfort merely; and since this habit is fostered by both personal feeling and mimetic instinct, it matures in the habitual wearing of skins and furs characteristic of hunting tribes. The intensity of the initial motive is attested by the bodily mutilations made to facilitate the wearing of the symbols; Seri warriors puncture the nasal septum to introduce symbolic sea-lion teeth and Cocopa warriors to suspend a stout sea-shell as a symbolic shield for the life-breath; the Western Eskimo perforate the lower lip on both sides and insert labrets symbolizing walrus tusks to invoke courage and fortitude; various tribes file the teeth in imitation of those of tutelaries, and some bore them to insert 'eyes' of nacre or gems; while the perforation of ear-lobes to insert invocative and emblematic objects is widespread. In the absence or rarity of large animals or where agriculture is arising, plant motives are substituted; in Hawaii flowers and in Samoa palm products are worn ceremonially in such profusion as to form partial dress, and the habit extends to gala occasions and even to every-day life; among the more sedentary Amerind tribes symbols of corn and native cotton are similarly worn in dances, and cotton fibre and corn silks were wrought into fabrics of increasing utility; while emblematic wreaths and chaplets of leaves or flowers were widely used in Eurasia in early historical times and exerted a permanent influence on headgear, which long remained emblematic in the Mediterranean region. The details of early habilimentation are far too many for recounting; yet any survey of the customs serves to indicate that primal clothing was largely devotional, and that the initial motives were of such intensity as to produce systematic bodily mutilation if not to guide physical development, and also that the advanced ideas of personal comfort and decency in dress evolved from habit long after clothing began.

Coördination. Purposive human coördination arises slowly in lower savagery; its simplest manifestation being that pan-zoism in which the lowest known peoples coördinate themselves and the animals (and perhaps other objects) of their range in a series usually led by a tutelary. In many tribes the sun symbolizes the dominant deity, and in some fire plays a related rôle. The process becomes practical when a particular tutelary actually coöperates with the human kind, as the dog in both hemispheres. Among Amerind tribes the smaller wolf or coyote is venerated for alertness, cunning, and a harmlessness interpreted as friendliness to men; accordingly his presence about camp or pueblo is tolerated and even encouraged, especially if there are animal or tribal enemies of whose approach he is supposed to give warning, and his voice and habits are studied in order that the warning may be understood; while he accustoms himself to the human habits and utilizes his immunity by becoming a camp scavenger. In prehistoric times the wolflings attached themselves to the human groups, and the semi-domesticated animals were not only employed as sentinels, but broken to burden and draught and used for food in emergencies, while yet remaining tutelaries worshiped in periodic ceremonies. Coincident stages in the toleration and domestication of the reindeer are revealed among Siberian tribes, where the half-wild animals are tutelaries, yet are collectively claimed and covertly herded by human groups, this condition passing into individual ownership like that of the Laplanders. The contemporary instances throw light on the domestication of kine, swine, sheep, goats, camels, and fowls in prehistoric times, as well as on that of the horse, in whose case the analogies have recently been verified by Curtin in the region south of Lake Baikal, where the animal is still a tutelary and roams in herds over which particular clans claim custody. The customs of many Amerind tribes extend to plants, notably corn, which is deemed zoic if not anthropic, and is primarily an object of veneration and ceremonial worship and only secondarily a source of sustenance — the intensity of the motive being attested by the cultivation to color standards already noted; while the complete coördination of plants and animals and men in systems in which the mutually beneficent are preserved and the malevolent eliminated constitutes agriculture as pursued in different countries. Certain of the primitive customs throw light on the most important step in human progress, viz. the conquest of fire. Many tribes consider fire an animate tutelary; some, like the Seri, class it as of their own kind and look on its production as a vital process connoted with human reproduction; other tribes ally it more closely with plants (also deemed animate), as suggested by the 'red flower' of East Indian lore. The crude analogies of its consumption of woody tissue, its breath, its reproduction, its dread of water, its incense-making, its fierce outbreaks as if taking the warpath, and its frequent death—all weighty in primitive thought—need not be followed; but it cannot be too strongly emphasized that the taming of fire, like that of the animal tutelaries, involved acquaintance and association of such duration as to permit the growth of philosophies in sluggish minds. There are strong indications that the primal sources must have been feeble volcanic fires or steady-flowing lavas; for to primitive folk volcanoes, like plants and streams and other objects, are animate and enter into daily thought as agencies to be tolerated and utilized by carefully weighed customs. In general terms it may be said that the coördinative activities are primarily zoötheistic and collective, that they arose practically in a toleration which between men and animals is mutual, that they mature slowly in zoöculture and agriculture and in control on an economic basis, and that in every stage the dominant force is growing mentality.

RECONSTRUCTION. The reconstructive industries may be said to begin with the habitual use of implements or tools as adjuncts to the natural organs. Neglecting the casual or mimetic use of missiles and weapons by simians and men, the lowest known implements are actual or symbolized organs, i.e. teeth, claws, beaks, talons, spurs, and shells such as form emblems in primitive ceremonies. Thus the Eskimo used walrus and narwhal tusks as harpoons, the Pacific islanders used saw-fish blades as sabres, and various tribes render their war-clubs actually as well as symbolically effective by inserting teeth of crocodiles, sharks, and other powerful creatures. The customs of the Seri tribe are especially instructive since they remain so near the threshold of implement-using as to lack knife sense and prefer taking large game in the hands, tearing and devouring deer and antelope and even horses and kine with teeth and nails aided only by edgeless cobblestones; among them the arrow-point or foreshaft, the slip-head of the harpoon, and the hardwood point of the masculine firestick symbolize teeth, and are so called in their language; the awl, or perforator, is either a bird mandible or a bit of wood shaped in imitation of that organ; and the sole hand implement in habitual use is merely a cobblestone of convenient size, of which one form is designated a tooth. This is used chiefly by the matron, and if strong and of approved size becomes a permanent possession and in time is worn and polished by use, when it acquires a fetishistic character and is buried with the owner at death. The implement is edgeless; doubtless a practical reason for this is the superior safety in the fierce stress of chase and dismemberment of quarry, but in tribal custom the implement becomes tabu, and is discarded in terror and loathing when so broken accidentally as to form sharp edges; the only edged stone is the arrow-point, made ceremonially in imitation of those of neighboring tribes by aged clan-mothers, and deemed so magical as not to be named save by seeresses. In a higher type noted by Powers in California the pebble is so cleft by natural agencies as to form a sharp edge; in still higher types it is purposely cleft and chipped; and among more advanced tribes the arrow-maker is a medicine-man or shaman, who is believed to infuse occult potency into the products of his craft. In parts of California arrow-heads and spear-points were flaked and chipped from obsidian, and when small were quite effective, though the highest skill of the makers was expended on huge blades reaching twenty inches in length, which were useless in chase or warfare by reason of brittleness; these were used by shamans in ceremonies and served as insignia of power until the death of the owner, when they were sacrificed with his body. In Mexico obsidian was quarried in blocks or 'cores,' from which thin flakes were struck for knives, lances, and razors, so commonly that the material became an important industrial factor; yet here, too, the finest products, including large blades and carved axes far too fragile for practical use, were votive forms to which magical powers were imputed. Even more significant was the pipestone, or catlinite, found in a single locality in Central North America, to which such potency was imputed that by intertribal convention it was consecrated to Manido (or Great Mystery) and perpetual peace, and was made free to all tribes and peoples; it was used chiefly for calumets or pipe-tomahawks symbolizing the alternatives of peace and war, though it was so soft and fragile that the blade was totally unserviceable, while, despite watchful protection, the bowl seldom lasted through the life-time of its owner. Granite and other hard and strong materials were used for hammers, club-heads, celts, pestles, and hatchets or tomahawks characteristic of American aboriginal culture; but some of these were too delicately carved and polished for practical use, and were kept by shamans as types and tokens of skill to be displayed in ceremonies as 'Ancients' or progenitors of their kind; while the most elaborate hard stone carvings (such as the 'collars' and 'yokes' of Mexico and the Antilles) are symbolic in both form and finish, and were used solely in ceremonies. The American examples throw light on stone cults in the Old World, including those of jade in the Orient and gems in Africa, and various vestiges indicate that their original motives were parallel to those of the Western Hemisphere. Other industries reveal similar motives; among the California tribes the basket is a general utensil (kettle, water-bucket, dipper, canteen, berry-pail, cap, etc.), and basket-making is highly developed, yet the finest products are sacramental forms, woven by matrons with their clan emblems inwrought, to be used in a few important ceremonies during their lives and then burned or buried with their bodies. Among the Pueblo tribes pottery formed the general utensil, and here, too, the finest specimens, bearing elaborate painted or modeled symbols, were consecrated to ceremonies and mortuary sacrifice; and the same was true of blanketry and other fabrics. In parts of America primitive stone-working grew into a crude metallurgy, in which native metals were wrought cold or at moderate heat. Meteoric iron (which is hot-short, and hence workable only at low temperature) was occasionally wrought into ceremonial forms, while copper was extensively used for arrow-heads or spear-points and celts, modeled after the stone types, and also in sheets from which symbolic devices were shaped; both were wrought with stone tools cold or hammer-heated, the blades being hammer-tempered (the inelastic stones giving a peculiar hardness sometimes increased by subsequent patination), and the thin sheets bent over stone or other mandrels and punctured or cut by indenting one side and grinding the other. In Mexico, Central America, and Peru native silver and gold were wrought into ceremonial objects by artificial heat up to the point of partial fusion; the motive attending the critical step from cold hammering to hot forging surviving the notion of the Navaho silversmith that the warming of metal under the hammer is an appeal in kind for fire-heat, and that its gratification is rewarded by diminished resistance to the efforts of the smith—i.e. the motive is typically primitive and analogous to that in which corn is thought to be hardened by planting quartz pebbles with the grains and sweetened by sprinkling honey over the sprouts when they first peep through the soil. The aboriginal Americans were on the verge of founding, with its accompaniments of smelting and alloying, at the time of the Conquest; and the stages of their progress undoubtedly correspond fairly with the prehistoric development of Old World metallurgy up to the dawn of the Bronze Age in Eurasia and the Iron Age in Africa. The successive steps in each region and the influences of cultural interchange were many; but in brief, the primal efforts were zoömimic (or mimetic of zoic tutelaries) and the products without preconceived design, while later the efforts were influenced by symbolic types and devotional ideas as well as design, and the motives became partly practical; still later the efforts gradually passed under the control of previsional designs and the motives became economic. Classified by typical materials, products, and motives, the chief steps are shown in the accompanying table:

TYPES	Typical materials	Typical products	Typical ideas
1. Zoömimic	Bestial organs	Awls, spears	Zoötheistic faith
(a) Transitional	Symbolized organs	Harpoons, arrows	Faith + craft
2. Protolithic	Natural stones	Hammers, mullers	Chance + faith + craft
(b) Transitional	Cleft stones	Mullers, cutters	Chance + craft
3. Technolithic	Artificialized stones	Arrows, spears, knives	Design + molar action
(c) Transitional	Native metals	Spears, celts, gorgets	Design + molar action + chance heating
4. Metallurgic	Smelted ores	Cutlery and tools	Invention + molecular action

Transportation. Early transportation is limited to packing or carrying; and since in primal thought the female is not merely the blood-carrier, but the custodian of the children and property of the clan, she becomes the chief burden-bearer. In the ante-cradle stage the child usually clings astride the mother's left hip or perhaps to her back, leaving her right arm free; the water-vessel is commonly balanced on the head, while bedding and food are borne on the back or in the hands. The burdens of the male are commonly limited to weapons and products of the chase or field. As the toleration of animals matures they are impressed, at first under the notion that their mysterious powers lighten their loads—a notion akin to that under which primitive packers approaching a pass carry a stone as a symbol of burdensomeness to be cast away at the summit in token of relief, a custom so common that hundreds of passes in Western America are marked by stone-heaps. The primal land vehicle is the travois, originally poles for tent or fuel dragged by woman or dog on which impedimenta may be thrown, and later consisting of two elastic saplings harnessed on either side of the draught-animal and connected behind by a platform or net for carrying the load; in northern regions this grades into the sleigh or toboggan, which pertains to hunters as well as matrons and is drawn by men, women, or dogs. America produced the germ of the wheel in the racing football and especially in discoid and annular gaming stones, to which self-motility and power of pulling their throwers forward were imputed; according to Cushing these were used ceremonially in transporting heavy roof-beams for pueblos from distant mountains, and in Mexico and Peru short cylinders were used as rollers in moving heavy stones and beams; yet in the absence of powerful draught-animals the devices failed to mature in wheeled vehicles, as related devices appear to have done in the Old World. Among the most primitive water vehicles are the balsa and coracle, the former made of reeds bundled in the form of either a fish or a swimming fowl and usually bearing piscine or avian symbols, the latter preferably made from the skin of a swimming animal; these grade into canoes of various types, some modeled after water creatures, and these into specialized craft long bearing emblems of dolphins or nereids or other actual or mythic tutelaries. The balsa may be propelled by the hands or hands and feet of a prone occupant used as in swimming; among the Seri the propulsion is made more effective by holding a sea-shell, or a short wooden paddle as a symbol of the shell, in either hand; and these grade into the paddle and oar, in some cases professedly fashioned and wielded as symbolic fins. Still later sails are used, and various vestiges in lore and emblems and terminology connect the early use of the devices with avian tutelaries. In early navigation, swimming adjuncts are employed, the most widespread among lower peoples being air-bladders of aquatic creatures.

The educative activities of primitive men are few, but intense. Especially among wandering tribes, movements are led and the pace is set by the strongest, and the others follow in order and are expected to keep their places under penalty of contempt or abandonment; in this strenuous school youths and children are exhorted to rely on tutelaries for strength and endurance, and actually develop vigor and fortitude; while weaklings and the aged are supposed to be deserted by the deities, and in some tribes are left to their fate as a pious duty. Among more sedentary tribes racing, dancing, and other ceremonies afford competitive tests of physical and devotional strength; the Huichol Indians take long journeys, fasting, in search of a stimulating plant, and in the Papago tribe the boys are expected to join in a fasting pilgrimage of some hundreds of miles across deserts to the sea and back before they can hope to attain the privileges of manhood; among Australian and African tribes equally strenuous tests are prescribed; and among the Mandan the probationary ceremonies attending admission into the warrior class involved actual torture. In addition to the customs affecting the youth in general, most primitive peoples observe special usages connected with the maintenance of professional or priestly classes. Commonly the candidate solicits preliminary instruction from an aged shaman, and pursuant thereto withdraws into the forest or mountains or desert for fasting and invocation, which are continued to the point of hallucination, when he is supposed to receive a new character and perhaps a new totem or name from the 'vision,' and returns to his kindred a duly qualified shaman. In certain Papago clans the candidate sleeps fasting near a great rock supposed to harbor rattlesnakes, until the Great Ancient Rattlesnake inducts him into a mystery chamber beneath; in the Kiowa tribe ambitious men may 'dream' a shield, which thereafter becomes the insignia of an order; among the Siouan tribes the youth generally fast until a 'vision' of an animal appears to become his totem, while in the related Iroquoian custom described by Schoolcraft and Longfellow, the culture-hero Hiawatha fasted and invoked the powers until Mondamin, the Corn Maiden, appeared and gave corn to men. Sometimes the hallucinations are hastened and intensified by the use of stimulants or narcotics, regarded as sacred and used ceremonially; the Kiowa and Mescalero-Apache tribes use peyote (a cactus containing toxic alkaloids which at once stimulate and produce color phantasms), the long Huichol pilgrimages are made in search of a similar plant and sustained by its stimulating effect, several Mexican tribes brew beverages to produce ceremonial intoxication, and the natives of Florida used a toxic 'black drink' to fit themselves for important ceremonial functions; all customs which throw light on the uses of hashish, poppy, and lotus in earlier times and other lands. The educative activities of primitive life hardly extend beyond the physical and devotional training of youth and the ceremonial probation of candidates for admission to special classes. The striking features are the predominance of ceremonial motives and the absence of previsional control; for it is only in higher culture that the means of education become economic, the methods practical, and the motives rational.

In general view the industries fall into a developmental series, in which the actions pass from the simple to the complex, the methods from the devious to the direct, and the motives from the mechanical to the sacramental, and thence to the rational; the successive steps being marked by continually increasing mentality, growing independence of natural environment, and advancing conquest over the animal, vegetable, and mineral realms, all interrelated and proceeding cumulatively.

SOCIOLOGY: LAWS, OR INSTITUTIONAL ACTIVITIES. While the unit of *Homo sapiens* is an individual organism, the unit of social mankind is a group. In observed primitive societies, in ancient societies described by historians, and in primal societies inferred from vestiges and analogies, the unit groups are maintained by (1) mechanical, and (2) conventional laws, the latter being (a) instinctive, (b) ceremonial, and (c) rational in varying degrees; and the course of human progress is marked by the development of these laws. Their essential function is that of regulating the relations between the individual and the group; and they relate to person and property in varying degrees in successive stages. In general they are simpler but more definite and rigorous in the earlier stages, more comprehensive and more beneficent in the later, the passage accompanying the growth of mentality as well as the enlargement of the groups; and while measurably gradual, the original passage was apparently accelerated at certain points defining the chief stages of human progress. In each stage the social groups tend to approach a distinctive type characterized by modes of reckoning relationship and by current beliefs; arranged by sequence and leading characters, the stages and types are as follows:

STAGE	Relation	Control	Motive	Form	
Savagery	Maternal	Avuncular	Zoöcratic	Clan	Tribal society
Barbarism	Patriarchal	Vicarial	Theocratic	Gens	
Civilization	Monarchical	Hereditary	Aristocratic	Kingdom	National society
Enlightenment	Electional	Popular	Democratic	Republic	

The lowest social organization known observationally is that of the Australian natives. Here the laws are remarkably definite and are connected with religious observances; they relate chiefly to the person, and operate through marriage and the family. Commonly the tribe or band comprises four subgroups or clans (i.e. two couples), between which intermarriage is permitted in a series of combinations varying with the order of the groups and with sex in each, the system being so intricate that Caucasian students find difficulty in tracing it. The fullness and force of the regulations render mating a public function (indeed, attendant customs make it measurably collective) performed with the sanction of two or more groups and connected with imposing ceremonies both before and after the event, including remarkable puberty rites. As in higher savagery, the marital groups are organized under totems or tutelaries, and the respective duties and privileges of the clans, like those of the sexes, are measurably differentiated. The attendant property regulations are inconspicuous, though well understood by the tribesmen; in general the range and resources are common to all, food is communal, and strictly personal possessions are regarded as tabu to others by reason of a putative infusion of personality. Probably the lowest known social organization on the Western Hemisphere is that of the Seri Indians; here, too, the chief regulations relate to the maintenance of the group and operate through marriage, the property regulations being subordinate. Mating in the clan is prohibited, but inter-clan unions are limited only by general consent and compliance with requirements, which include material and moral tests of the groom. After negotiations between the elderwomen (or clan-mothers) with the approval of the elderbrothers (or war-chiefs) of the two clans, the would-be groom enters the family of the prospective bride, and for a year provides game or other food for the family group, and meantime maintains continence (which is not imposed on the other partner with respect to his clan-fellows); and at the end of the probation the marriage is celebrated with a ceremonial feast. Thenceforward he becomes a perpetual guest of his wife, without authority over her house, children, or other property, and outranked by the wife's brothers—though he may be an elderbrother or chief in his own clan. Unlike the Australians, the Seri are warlike, and the regulation of leadership is definite. In each clan the eldest matron or clan-mother forms the legislative and judicative head, and exercises a control actually measured by her shrewdness and strength, but putatively determined by the power of the totem of which she is deemed the vicar; while her elderbrother becomes, by virtue of his relationship, her administrative, and hence the war-chief of the clan. The several clans are arranged in the order of the power imputed to the respective tutelaries, and the clan-mother and elderbrother of the foremost clan become the law-giver and the war-chief for the tribe. The order of the clans is liable to change, usually through bloody revolution, when the rank of the tutelaries also changes; and infractions of law are punished by contempt or ostracism for petty offenses, outlawry for misdemeanors like failure in the marital tests, and summary execution for crimes—the executioner being determined by rules connected with kinship. There are striking correspondences in the regulations of the Australian and the Seri tribes, despite the fact that the former are pacific and their regulations adapted to tribal extension, while the latter are warriors, whose regulations inhibit expansion save along rigorously guarded lines of tribal blood. These customs show that primitive societies are far from promiscuous hordes, but are definitely organized groups, regulated by instinctive and religious observances having all the power of law.

In more advanced tribes the social regulations are modified partly through recognition of paternal function (in which the father sometimes assumes pseudo-maternal functions as in the couvade, q.v.), partly through increase of possessions with the attendant property sense, though still resting on the family basis. The service forming the material test of the Seri groom is commuted into goods already acquired, while the moral test is liquidated in formal ceremonies as among the Zuñi, or in functions connected with property as among the Carolinian tribes observed by Lawson; later mating is limited by possessions either nominally material, as among most tribes, or religious, as among the Kwakiutl, where the contracting parties balance their totemic or heraldic heritages as a basis for the union; and these customs tend to grow into the purchase and eventually into the capture of wives, with consequent enslavement of women. Concurrently, male as well as female captives are permitted to live with increasing frequency; these may be classed as 'younger' than all their captors (i.e. inferior, usually because taken from a tribe deemed of lower totemic rank), when they become permanently subordinate, or perpetual slaves; or their 'age' (i.e. social status) may be reckoned from date of capture, when they rank as 'younger' than all members of the captor tribe then living, but 'older' than those born subsequently, in which case the slavery is temporary only—and this custom matures in formal adoption, which tends to break down consanguineal barriers. Meantime increase of property (especially in live stock) carries growing administrative responsibility and tends to enlarge the functions of the husband, who step by step assumes control of the household; thus, among the Cocopa the husband owns the house, field, and growing crops, while the wife owns the harvested crop, the domestic fowls, and the household appurtenances; while among the Muskwaki the first-born child is named by the father (i.e. after his totem), though in case of its death the right of subsequent naming returns to the mother. The steps attending the transition from maternal organization to the fully developed patriarchal condition, and from family law to property regulations, are numerous and more or less unlike in different environments, though on the whole the similarities in the various countries exceed the differences; and it is noteworthy that in every stage the regulations are definite, firmly fixed by custom, and controlled by contemporary faiths.

As clearly shown by Fustel de Coulanges, the transition from migratory patriarchy to sedentary civicism was accomplished by growing recognition of territorial rights with the reciprocal rights of neighbors; in Central Europe the transition was effected through a feudalism well traced by Sir Henry Maine; yet the family long remained the essential social unit through which hereditary aristocracies were maintained. The accompanying transformation in motive was largely guided by a revolution in faith which need not be traced; nor is it needful to pursue the consequent transformation whereby the individual and the State are becoming the fundamental social factors, with family and other groups occupying intermediate positions.

Philology: Language, or Expressional Activities. The languages spoken by mankind are known only in part, probably in small part. It may be noted merely as connecting linguistic development with human progress along other lines that the more primitive known languages are definite in vocabulary, elaborate in grammatic structure, and intimately connected with concurrent systems of belief. Thus among many tribes in different countries personal names are esoteric or tabu except in the family or phratry, and among some of the California tribes the entire tongue is more or less sacred to the group and language forms the ostensible basis of the actually consanguineous organization. So, too, in many tribes ritualistic chants and other ceremonial recitals are uttered in changed voices and sometimes in archaic terms, with the aim of more effectively reaching the tutelaries. With advancing culture there is a tendency to adopt more general forms of expression even while the integrity of the tribal tongue is maintained, as, e.g. in the intertribal sign language or gesture-speech so widely used in Central North America; while with the development of arbitrary characters hieroglyphic writing and hieratic speech were long employed for ceremonial purposes. In general it may be said that the course of development of human language is from the formal toward the general, from the religious toward the rational, and from indefinite plurality toward a few leading lines, if not toward unity.

Sophiology: Ideas, or Interpretative Activities. Any survey of the lines of human development reveals a continuous interrelation between the æsthetic and industrial and social advances and the growth of ideas; it also reveals a progressive (indeed cumulative) increase in the prominence of the rôle played by ideation in every stage from the dull mechanical prime through the gloomy philosophies of savagery and barbarism to the confident inventiveness which overcomes lower nature.

In lower savagery conduct is controlled by fear of the unknown, and at sight or sound of the uncanny men crowd together like gregarious and other social animals for mutual support, and the interpretations become collective; fearful of darkness, they usually assemble at night, and naturally fall into habits of collective feasting and rejoicing over a successful day, and of intimidating real or imaginary enemies by combined action, while as fear subsides with the dawn there is more or less vociferous rejoicing; and these collective movements tend to become ceremonial. Clear vestiges of this stage survive among the Australian natives, who hold nocturnal corrobborees on unusual occurrences, and among the Seri, who engage in nocturnal mournings and celebrate the sunrise with acclamations and obeisances; while related observances have been noted among various peoples. In this stage the ceremony or observance is dominant, the interpretation subordinate; the motive is terror, sometimes specific, oftener vague and general—the stage is that of hecastotheism, the faith of fear. Death is dreaded supremely, and mortuary observances may exert a profound influence, as in the Mangyan tribe of Mindoro, who desert the house and district in which a tribesman falls fatally ill, and among some of the Australians, who desert the range in which a death occurs. Such customs and motives so closely approach those of various lower animals and so manifestly underlie those of higher human groups that they may be deemed essentially primal. Among most savages fears are concentrated on animals or objects supposed to be animate, the strong and the swift and the nocturnal being especially mistrusted, and most of these are tutelaries invoked by ceremonies and propitiated by sacrifices; in this stage, too, the interpretations, like the observances, are collective; and since the animals of the tutelary kind are occasionally or habitually captured or slain, the fear motive tends to weaken. This is the stage of zoötheism, a faith of hope, which corresponds in part with the animism of Tylor. Throughout it the dread of death persists, yet mortuary ceremonies become elaborate and sacrificial or propitiative; the Cocopa distribute the movable property of a deceased person among non-relatives and then burn the body with the domicile and any remaining possessions; some of the California tribes cremate the body with the most precious possessions, and others throw the remains and property into a natural or artificial cavern; the Papago build a miniature house to which the body is conveyed the instant breath ceases, and both personal property and that of close kindred is sacrificed; several Amerind tribes place the body on a scaffold surrounded by sacrificial possessions; various canoeing and sledging tribes sacrifice the vehicle with the body of its owner, and among some it becomes both bier and coffin; many tribes inter their dead in stone or wooden cists, and some erect imposing mounds over the remains of their personages. (See BURIAL.) Among most primitive peoples there are collective mournings, frequently accompanied by fasting or even drunken orgies. The observances commonly include supplying the deceased with food and drink, weapons and utensils, clothing and votive objects, and perhaps domestic animals and slaves or wives sacrificed at the tomb; frequently the inanimate as well as the animate things are 'killed' by breaking, cutting, perforating, or burning. (See MORTUARY CUSTOMS.) In a still more advanced stage fears are largely withdrawn from contemporary animals and the 'Ancients' of which they are deemed descendants, and are concentrated on nature powers, to which either zoic or anthropic attributes are imputed. This is physitheism, which accompanies barbarism, and grades into heroic mythology, ancestor worship, and certain forms of idolatry, of which examples are too many for listing; eventually it matures in the psychotheism or spiritualized faith of higher peoples.

While primal fears grew into crude superstitions and these were gradually replaced by refined religions, the more positive qualities of mankind underwent a parallel development, and experiences were generalized in growing systems reflected at every step in habits and customs, methods and motives; these were measured by the successive stages in æsthetic, industrial, and social development already outlined. Meantime the current philosophies were influenced more and more by experimental methods and the earlier types were enriched or replaced by more definite systems from which have gradually evolved the modern sciences. For works of reference, see ARCHÆOLOGY, AMERICAN; BURIAL; ETHNOLOGY; MARRIAGE; RELIGION, COMPARATIVE.

MAN, ISLE OF. An island in the centre of the Irish Sea, whence its Manx name *Vannin* or *Mannin*—the middle—16 miles south of Burrow Head in Wigtownshire, Scotland, and 27 miles equidistant from England and Ireland (Map: England, B 2). It is 32 miles long, 12 miles broad, and 220 square miles in area. At the southwest extremity is an islet called the Calf of Man, containing 800 acres, largely cultivated. The scenery is varied and picturesque. A mountain chain extends from northeast to southwest, culminating in Snaefell, 2034 feet above the sea; from its summit the view embraces the wooded glens and undulating country in the foreground; the rich plains of the north and south of the island in mid-distance; and beyond, the Irish Sea, bounded by the highlands of the surrounding countries. Several trout streams take their rise in these mountains.

The greater part of the island consists of clay-slate under various modifications. Through the clay-schist granite has burst in two localities, in the vicinity of which mineral veins are extensively worked. Great quantities of lead are extracted annually, as well as considerable quantities of copper, zinc, and iron; the lead ore is the richest in silver in the United Kingdom. The climate is remarkable for the limited range of temperature, both annual and diurnal; westerly and southwesterly winds predominate, easterly and northeasterly winds occurring chiefly in the autumn quarter. Myrtles, fuchsias, and other exotics flourish throughout the year. Agriculture is followed, especially in the southern part of the island and in the level districts to the north. On the hillsides in the interior many cattle and sheep are pastured. The island is noted for a breed of tailless cats. The Isle of Man is a great summer resort for operatives of Lancashire and Yorkshire, and at various points dancing pavilions have been erected. Steamers ply regularly between it and Liverpool, Fleetwood, Barrow, Silloth, and other ports. The herring, mackerel, and other fisheries are important. The manufactures are unimportant, but the natives derive a large income from the thousands of visitors that come to the island each season.

There are many interesting antiquities on the island. Near Castletown, the ancient capital and seat of government of the island, is the well-known Castle Rushen, which was once the palace of the native kings. Douglas, the capital of the island and its principal seaport, contains the so-called

'Tower of Refuge,' and the former residence of the dukes of Athol. Sixteen miles from Douglas lies Port Erin, a picturesque watering-place on a small bay. Between Douglas and Peel, a distance by rail of 12 miles, is Greeba Castle, the residence of Hall Caine, whose writings have done much to make the manners and customs of the Manx familiar to the general public. Peel is remarkable for its castle on Saint Patrick's Isle, joined to the mainland by a causeway, which in its present form dates chiefly from the fifteenth century. The ruins of the cathedral stand within the castle inclosure.

The Isle of Man forms a separate bishopric under the title of Sodor and Man. The Manx Church has its own canons and an independent convocation. The see is, for certain purposes, attached to the Province of York. There are in the island about forty places of worship in connection with the Established Church of Man. The livings are, with few exceptions, in the gift of the Crown. The principal denominations of dissenters are represented in the island.

The Isle of Man has a constitution and government of its own, to a certain extent independent of the Imperial Parliament. It has its own laws, law-officers, and courts of law. The legislative body is styled the Court of Tynwald, consisting of the Lieutenant-Governor and Council—the latter being composed of the bishop, attorney-general, two deemsters (or judges), clerk of the rolls, water bailiff, archdeacon, and vice-general—and the House of 24 Keys, or Representatives. The native language, Manx, a dialect of the Celtic, is still spoken, and is taught along with English in the parish schools. It is spoken chiefly in the northwestern parishes and in certain localities on the west coast. It has a marked similarity to the Irish and Scottish Gaelic dialects.

Previous to the sixth century the history of the Isle of Man is involved in obscurity; from that period it was ruled by a line of Welsh kings, until near the end of the ninth century, when the Norwegian Harald Haarfagr invaded and took possession of the island. In the beginning of the tenth century Orry, a Dane, effected a landing, and was favorably received by the inhabitants, who adopted him as their king; he is said to have been the founder of the present Manx Constitution. A line of Scandinavian kings succeeded until Magnus, King of Norway, ceded his right in the island and the Hebrides to Alexander III. of Scotland, 1266. On the death of Alexander, the Manx placed themselves under the protection of Edward I. of England by a formal instrument dated 1290; on the strength of this document, the King of England granted the island to various royal favorites from time to time, until the year 1406, when it was granted to Sir John Stanley in perpetuity, to be held for the Crown of England, by rendering to the King, his heirs and successors, a cast of falcons at their coronation. With the exception of a short period during the Civil War, when the island was surrendered to a Parliamentary force by Receiver-General Christian, and was granted to Thomas Lord Fairfax, it remained in the possession of the Stanley family and their descendants until, having been for a long period the seat of an extensive smuggling trade, to the detriment of the Imperial revenue, the sovereignty of it was purchased by the British Government, the amount paid aggregating £493,000, and the negotiation extending from 1765 to 1829. Population, in 1891, 55,608; in 1901, 54,758. Consult: Cumming, *The Isle of Man: Its History* (London, 1848); Train, *Historical and Statistical Account of the Isle of Man* (Douglas, 1845); the works published by the Manx Society (19 vols., Douglas, 1858-68); Caine, *The Little Manx Nation* (London, 1891); and Walpole, *The Land of Home Rule* (London, 1893).

MAN, HENRY (1747-99). A friend of Charles Lamb. He was born in London and educated at the Croydon Grammar School, then under Rev. John Lamb. At the age of fifteen he became clerk in a London mercantile house. In 1776 he was appointed deputy in the South Sea House, where he formed a friendship with Lamb. He is 'the wit, the polished man of letters,' sketched by Elia. Man's publications comprise mainly the *Trifler*, essays (1770); letters on education contributed to the *Morning Chronicle* (1774); and *Cloacine*, a dramatic satire (1775). Consult *Collected Works*, with memoir (London, 1802).

MANABOZHO, mä'nȧ-bŏ'zô, or MICHABO. The culture hero and ruler of gods and animals among the Algonquian tribes. He is represented as the principal agent in the work of creation, the teacher of the various Indian arts of hunting, fishing, and the like, the destroyer of monsters and neutralizer of evil influences, and withal as a great trickster. There seems no doubt that he was originally the god of light and day, venerated under different names, but with strikingly similar characteristics, throughout the continent. See HIAWATHA.

MANACOR, mä'nȧ-kōr'. A town on the island of Majorca, Spain. It is situated on a small eminence surrounded by a fertile plain, eight miles from the eastern coast of the island (Map: Spain, G 3). The town contains a number of ancient buildings, among which is a palace of the old kings of Majorca. It has manufactures of brandy, flour, pottery, and leather; is connected with Palma by rail, but has no great commercial importance. Population, in 1900, 12,548.

MANAGUA, mȧ-nä'gwȧ, **LAKE** (formerly called LAKE LEÓN). A lake in Nicaragua, Central America, situated eight miles northwest of Lake Nicaragua, with which it communicates intermittently through the Tipitapa River (Map: Central America, E 4). Lake Managua is 40 miles long and 6 to 15 miles wide, and its waters lie 30 feet above the level of Lake Nicaragua. It is believed that the latter was formerly at a higher level than now, and that the two once formed a single lake. The shores of Lake Managua are remarkable for their picturesque scenery—which is dominated on the northwestern shore by the volcano of Monotombo. Several steamers ply on the lake, and Managua, the capital of the Republic, is situated on its southern shore.

MANAGUA. The capital of Nicaragua, situated in a healthful and fertile district on the south shore of Lake Managua (Map: Central America, D 4). The town has little or no importance save as capital. It has a good water supply, and trades in the coffee grown in the surrounding district. Population, 17,000. Managua was made the capital of the country in 1855 to put an end to the rival claims of León and Granada. In 1876 it was destroyed by an inundation, but was soon rebuilt.

MANAKIN (OF. *manequin*, Fr. *mannequin*, from MDutch *manneken*, diminutive of *man*, man). The name manakin (or 'manikin') is applied to a large group of small tropical American birds difficult to define. In its narrowest sense the term is confined to the few species of the genus Manacus, which are birds with comparatively dull-colored plumage, but having the feathers of the chin elongated and puffed like a beard. In a broader way the term applies to the whole family Pipridæ, while by some writers it is extended to some of the Cotingidæ, a closely allied family. (A representative form of Pipra is illustrated on the Plate of COTINGAS, ETC.) In such senses, manakins are small, usually brightly colored birds with short, square tails, and a short, vaulted, broad bill, the upper mandible hooked at the tip and with a notch behind the point. In some species the wings and tail are modified so as to become very ornamental, and these changes are sometimes extraordinary. The sexes are very different in color, the females generally being greenish, while the males are usually glossy black, ornamented with brilliant scarlet, yellow, or blue. In the genus Heteropelma, however, both sexes are dull-colored, while in Machæropterus the general color is bright green with a fiery red crown, and the lower surface streaked, brown and white. The latter genus is further remarkable for the peculiar thickening of the tips of the shafts of some of the inner wing feathers, so that they appear as if ending in a pointed claw. In habits the manakins resemble tits and chickadees, hopping about in the lower undergrowth and feeding chiefly on insects. They are not song birds, however, but are more nearly related to the North American flycatchers. They are often seen on the ground, and some species nest there. A Brazilian species (*Chiroxiphia caudata*) is known as 'dansador' on account of a peculiar habit when several are together of holding small dancing parties; one individual whistles steadily while the others dance on the twigs around him, until the musician tires, when he exchanges places with one of the dancers.

MANÁOAG, mȧ-nä′wȧg. A town of Luzon, Philippines, in the Province of Pangasinán, about sixteen miles east of Lingayén (Map: Luzon, D 2). It has good road connection with stations on the Manila-Dagupán Railroad. Population, 17,500.

MANAOS, mȧ-nä′ôsh. Capital of the State of Amazonas, Brazil, situated on the eastern bank of the Rio Negro, 10 miles from its junction with the Amazon (Map: Brazil, F 4). It is a large and well-built city, lighted by electricity, and has fine parks and public buildings, a lyceum, a school of chemistry, a museum, and a public library. The city has a good harbor to which ocean steamers ascend directly from Europe and the United States, and a flourishing trade in the products of the Amazon forests, especially rubber, which it exports in large quantities. The city is connected by cable with Pará, and it is growing very rapidly, its population in 1901 being estimated at between 30,000 and 50,000. Manaos originated in a Portuguese fort built here in 1804 as an outpost for the slave trade. It was first called Barra do Rio Negro, and received its present name in 1836, from a neighboring tribe of Indians. It became the capital of the State in 1852.

MANAR, mȧ-när′, GULF OF. The southern and wider part of the channel separating Ceylon from the southern extremity of India. It is nearly 150 miles wide at its broadest part, and narrows northward into Palk Strait, from which it is divided by a chain of islands and a low reef called Adam's Bridge.

MANASAROWAR, mȧ-nä′sä-rô-wär′. A lake, 12 miles wide and 18 miles long, situated north of the Himalaya Mountains, between the sources of the Indus and the Brahmaputra. According to the account in the Hindu Scriptures it was formed when the ocean first fell down from the heavens, and it is one of the most sacred places of pilgrimage, both for the Hindus and for the Tatars.

MANAS′SAS, FIRST AND SECOND BATTLES OF. See BULL RUN, FIRST AND SECOND BATTLES OF.

MANAS′SEH (Heb. *Mĕnashsheh*, of uncertain etymology). According to Gen. xli. 51, the eldest son of Joseph and eponymous ancestor of the tribe of Manasseh. Manasseh and Ephraim are thought by critics to represent two offshoots of a Joseph clan, the parent branch of which (see JOSEPH) apparently disappeared in Egypt. Of the two, Manasseh was the first to cut loose, and was therefore represented in tradition as the older; but the far more prominent part played in the history of the northern kingdom by Ephraim is reflected in the forty-eighth chapter of Genesis, where Jacob, in blessing the two, intentionally mentions Ephraim first, although the younger. Both Manasseh and Ephraim are represented as born in Egypt and sons of Joseph's Egyptian wife, which (if the tradition rests upon a genuine reminiscence) may be taken as an indication that the extension of the Joseph clan into several branches took place in that country. At the time of the conquest of Canaan, Manasseh and Ephraim appear as the most prominent of the tribes that afterwards formed the northern kingdom. The territory occupied by Manasseh on the west of the Jordan lay to the north of Ephraim and reached westward to the sea, including the plain of Sharon (Josh. xvii.), but the tribe continued to grow and a branch settled to the east of the Jordan, occupying part of Gilead, the rich pasture lands of Bashan and the country extending northward from a point above the River Jabbok to Mount Hermon (Josh. xiii. 29-31). The heroes Gideon and Jephthah (Judges vi. 15; xi. 1) belonged to Manasseh, but after the formation of the kingdom Ephraim entirely eclipses Manasseh, of which we hear again only at the time of the invasion of Tiglathpileser III. (B.C. 734), who carried off the eastern division of the tribe to Assyria (I. Chron. v. 26). The tribe also suffered severely during the various wars with Aram (II. Kings x. 32-33; cf. Amos i. 3).

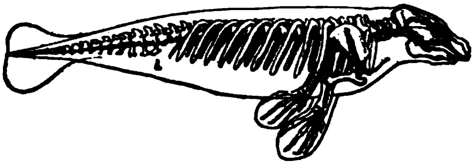
MANASSEH. King of Judah, son of Hezekiah and father of Amon. He began to reign c.692 B.C., at the age of twelve. His reign is said to have extended over fifty-five years (II. Kings xxi. 1; II. Chron. xxxiii. 1), but this figure may be somewhat too high, as his death appears to have taken place no later than B.C. 641. Of the events during his long reign we know little.

The narrator in Kings, being so largely interested in the religious side of history, contents himself merely with references to religious conditions in the days of Manasseh. The King is not viewed with favor by the pious narrator. The religious reforms introduced by Hezekiah, tending toward a purer Yahweh worship freed from the Canaanitish practices, naturally aroused opposition, and during Hezekiah's lifetime symptoms of a reaction already began to manifest themselves. The death of Hezekiah marked the height of the reaction, and Manasseh favored the old system and went even to greater lengths than his predecessors in blending the Yahweh with foreign elements. Besides readoption of the old Canaanitish practices, Babylonian and Assyrian customs were introduced (II. Kings, xxi. 5-7), and for this the King naturally incurred the hatred of the later Hebrew historians, who purposely ignored other events of his reign. It appears on the whole to have been peaceable and prosperous, but Manasseh was obliged to pay tribute to Assyria. The story told in Chronicles (II. Chron. xxxiii.) of Manasseh's capture by the Assyrians, and of his humbling himself before God and his acts of repentance, is thought to be fictitious. The Book of Kings does not say a word about it, and it resembles a Midrashic tale to illustrate the punishment merited by a king who, to the author of Chronicles, appeared the embodiment of wickedness. The later Jewish Haggada added to such stories of Manasseh's wickedness and subsequent conversion. The Prayer of Manasseh, the composition of which was suggested by the statement in II. Chronicles xxxiii. 18-19, belongs to the Apocryphal literature, though received as canonical by the Greek Church. It appears to have been originally written in Greek, though the sentiments are distinctively Jewish. The date of composition is uncertain; in a general way it may be said to belong to the Hellenistic period. Consult the commentary by Ball in the *Speaker's Commentary*, and the German translation with notes by Ryssel, in Kautsch, *Apokryphen und Pseudepigraphen* (Halle, 1899).

MANASSEH BEN-ISRAEL (1604-57). A Hebrew scholar and Cabbalist. He was born at Lisbon and educated at Amsterdam, where his father had removed to escape persecution. At the age of eighteen he took the place of his former instructor, Rabbi Isaac Uzziel, in the Amsterdam synagogue. In 1626 he set up a Hebrew printing-press at Amsterdam, and in 1632 published the first volume of his *Conciliador*, a learned harmony of the Pentateuch. Its author was recognized as a great Hebrew scholar and among his correspondents were Vossius, Grotius, and Huet. In 1656 Manasseh came to England to obtain permission from Parliament for the reëstablishment of the Jews in England, banished from that country since the time of Edward I. (1290). Parliament refused to pass the measure, but Cromwell favored it, and unofficially permitted a large number of Jews to settle in London. Manasseh died at Middleburg on his way home. His wide learning, the services he rendered his people, the renown he enjoyed among men not of his race, his piety and amiability, have made him a venerated figure in Jewish history. Besides the *Conciliador*, he published editions of the Talmud and Bible in Hebrew; also *Esperanza de Israel* (1650); *Pedro Glorioso* (1655); and *Vindiciæ Judæorum*, which appeared at London in 1656 during his stay in England.

MANASSES, PRAYER OF. See APOCRYPHA, section, *Old Testament*.

MAN'ATEE' (Sp. *manati*, from Haitian *manati*, big beaver). An American sea-cow of the genus Manatus, now nearly extinct on the coast of the United States, but still to be found in the West Indies, Eastern Central America, and tropical South America. Manatees are large, seal-like animals, sometimes 10 feet long and weighing more than a ton, with rounded, fleshy tail-fins, no hind legs, and the fore legs modified into swimming paws, the bones within which are of the normal type, and which have small, flat nails, except in the Orinoco species. The skin is very thick, dark gray, finely wrinkled, and sparsely provided with stout hairs, most numerous about the head and muzzle and on the palmar surface of the flippers. These animals are entirely aquatic, and spend their lives in estuaries, lagoons, and rivers, rarely going out into salt water. They ascend the Amazon and Orinoco almost to their sources, and are incessantly hunted by the natives for their veal-like flesh and the oil which may be obtained from the layer of blubber beneath the skin. They are good but by no means active swimmers, are sluggish in their movements, and spend most of their time in weedy places where they browse on the aquatic plants, often by standing upright among them on their bent tails. The upper lip is cleft into halves, which are covered with bristles and work against each other like forceps, forming an instrument by which they seize and draw into their mouths the leaves and grasses that form their fare. Connected with this food and manner of feeding is a remarkable dental feature, namely the large number of molar teeth. These seem indefinitely to increase during the animal's life, and it is suggested that they are worn away by the character of the food—chiefly algæ mixed with much sand. Only one young one is produced annually, but this is nursed and guarded by the mother with extreme care. The young apparently are entirely defenseless, but have few enemies to menace them after they get their growth. Manatees have frequently been kept alive in aquariums for a few months, and have proved gentle and docile. Once they were plentiful along both coasts of Florida, but their helplessness led to their destruction, until at the close of the nineteenth century none were left but a small, protected herd in the Miami River. Whether the Florida form, called *Manatus* (or *Hydrodamalis*) *latirostris*, is really distinct from the widely distributed *Manatus Americanus* is undecided. The animal of the Orinoco is certainly a separate species (*Manatus inunguis*), distinguished by lack of finger-nails. See SEA-COW; and compare DUGONG.



SKELETON OF A MANATEE.

MAN'BY, GEORGE WILLIAM (1765-1854). An English inventor of life-saving apparatus, born in Suffolk. He served seven years in the militia, and in 1803 was appointed barrack-master at Yarmouth. In 1807 he began working on his life-saving apparatus, by which in 1808 he saved the crew of the stranded brig *Elizabeth.* He twice received grants of money from Parliament, to which were added honorary distinctions from many foreign governments. It was estimated that by the time of his death nearly 1000 persons had been rescued from stranded ships by means of his apparatus. His publications include *An Essay on the Preservation of Shipwrecked Persons, with a Descriptive Account of the Apparatus* (1812).

MANCE, mäns, JEANNE (1606-73). A French philanthropist, born at Nogent-le-Roi. Her religious feeling was intense and she early vowed perpetual chastity, though she felt no inclination to become a nun. Influenced by the story of Madame de la Peltrie, she blindly determined to go to Canada and in 1641 went to La Rochelle to embark. While there she met Dauversière, who was founding a religious community to maintain a hospital at Montreal in honor of Saint Joseph, and determined to go with Maisonneuve (q.v.) and his men. Three other women at the last moment joined the expedition, which spent the first winter at Quebec, going to Montreal in 1642. The hospital was built with funds furnished by Madame de Bullion, and Mlle. Mance was in charge. She became second only to Maisonneuve in importance to the colony, as many executive details fell to her, in addition to her care of the sick and her work for the conversion of the Indians. She made several trips to France to secure aid in the work and stimulate the flagging zeal of the Associates of Montreal. She was also influential in bringing about the cession of the island to the Sulpitians, when the Associates were about to disband in 1657 (though the cession did not take effect for several years), and served as head of the Sisters of Saint Joseph until her death. Consult Faillon, *Vie de Mlle. Mance et histoire de l'Hôtel Dieu de Villemarie dans l'île de Montreal en Canada* (Villemarie, 1854).

MANCH, mänsh, or **MAUNCH** (OF., Fr. *manche,* sleeve, from Lat. *manicæ,* sleeve, handcuff, from *manus,* hand). A frequent charge in English heraldry, meant to represent a sleeve with long pendant ends, of the form worn by ladies in the reign of Henry I. See HERALDRY.

MANCHA, män'chȧ, LA. A district of Spain, in the provinces of Ciudad Real and Albacete, forming the southernmost part of the Kingdom of New Castile (Map: Spain, C 3). It is a level, arid, and treeless plateau, nearly 2000 feet above sea-level, and for the most part covered with esparto grass, which is an article of export. The upper waters of the Guadiana run through the territory with a sluggish flow. In spite of the dryness of the region, it produces considerable quantities of wine and grain. It is celebrated in Cervantes's novel *Don Quixote de la Mancha.*

MANCHE, mänsh, LA. A maritime department in the northwest of France, part of the old Province of Normandy (Map: France, E 2). Area, 2289 square miles. Population, in 1896, 500,052; in 1901, 491,372. It derives its name —signifying sleeve—from the configuration of the English Channel (Fr. *La Manche*), which borders its shores on three sides. The chief harbor on its coasts is Cherbourg. The surface of the department is irregular, being traversed from north to south by the Cotentin Hills. The Vire, the Douve, and the Selune are the chief rivers. Flax, hemp, and fruit are extensively cultivated, and apples are grown. Horses of the famous Norman breed and excellent cattle are raised. Capital, Saint-Lô.

MANCHESTER, măn'chĕs-tẽr. A city, civic county, municipal and Parliamentary borough, and inland port of Lancashire, England, the great centre of the cotton manufacture, on the Irwell, 32 miles east-northeast of Liverpool, and 188 miles north-northwest of London (Map: England, D 3). The principal public buildings are the Gothic Town Hall, built at the cost of more than a million pounds sterling; the Royal Infirmary, the Royal Exchange, the Royal Institution, all in the Grecian style; the Free Trade Hall, in composite, and the Assize Courts, in decorated Gothic; many of the mercantile establishments are palatial in appearance. Among ecclesiastical buildings the cathedral, commonly called the 'Old Church,' begun in 1422, is a very fine Gothic structure; Saint John's Catholic Cathedral, the Church of the Holy Name, and Cavendish Independent Church, are beautiful specimens of modern Gothic. The nonconformist churches outnumber the Episcopal churches two to one. Of numerous public monuments the most notable are a Prince Albert memorial in Albert Square, a bronze statue of Richard Cobden in Saint Ann's Square, one of Cromwell (unveiled in 1875) at the foot of Victoria Street, and one of Queen Victoria in Piccadilly. Manchester is encircled by populous suburban municipalities, connected by rail and tramways, and on the west side of the Irwell is the borough of Salford, connected by numerous bridges, and considered as virtually a portion of the city. Both boroughs were enfranchised by the Reform Bill of 1832, Manchester returning two members and Salford one member to Parliament. The redistribution of seats in 1885 gave Manchester six members and Salford three. Manchester was incorporated in 1838 and Salford in 1844. Manchester was made a bishopric in 1847, and received the title of city in 1853.

In 1885, in 1890, and in 1894 the municipal boundaries were enlarged and the suburbs of Bradford, Rusholme, Blackley, Kirkmanshulme, Morton, Newton Heath, Openshaw, and Gorton were included within the city limits. For purposes of administration, Manchester is divided into 25 wards, and is governed by a city council of 78 councilors and 26 aldermen; the mayor is elected by the council. The council elects from its own members sixteen standing committees which supervise the various municipal departments. Manchester derives a revenue of over $4,000,000 from its city rates, which is more than sufficient for all its municipal needs, taken together with the profitable undertakings which the city owns. Until 1847 the water supply was controlled by a private company and was so unsatisfactory that the city took it over. Nearly $10,000,000 were spent in the next 28 years in enlarging the plant. In 1874 Parliament passed a bill authorizing the city to get a new supply from Thirlmere, a lake over 90 miles distant, which was subsequently acquired by the city. This installation enables the city corporation to supply with water the neighboring towns as well. In addition it has hydraulic power works, distributing power by means of special water pipes. Manchester possesses the oldest municipal gas works in the world, its ownership dating from 1807. The city supplies with gas several of the adjoining towns. After furnishing all the public buildings, streets, etc., with gas at cost, and covering all expenses, interest and sinking fund payments, the city derives a net profit from the works of over $300,000 a year. Its electric light plant, opened in 1893, is also a great success. Manchester owns its street railways, but does not operate them, leaving that to a private company in consideration of a rental equal to more than 10 per cent. upon the city's investment. The city exercises a strict supervision over all the details of the company's work and compels it to run special workingmen's cars at certain hours in the morning and evening, at the rate of one cent per mile.

Manchester has gone to enormous expense in constructing a canal, which enables the largest ocean steamers to enter the heart of the city. This canal extends to the estuary of the Mersey at Eastham. The work of construction required an outlay of $75,000,000, of which the city contributed $25,000,000 on the condition of absolute control of the enterprise by the municipality, which is secured by allowing the city a representation of eleven members out of the total of twenty-one composing the board of directors. The canal, to a great extent a canalized river, is 35.5 miles long, twice as wide as the Suez Canal, and has a depth of 26 feet. It was ready for traffic on January 1, 1894, and formally opened by Queen Victoria May 21 following. Manchester has now six miles of quayage and dock accommodations of 100 acres. To make its provisions for all the commercial and industrial facilities complete, the city takes considerable pains to keep up a good supply of efficient and highly skilled craftsmen, mechanics, foremen, etc., for its diverse industries. All the chief technical schools, formerly conducted by private individuals, have been consolidated under a municipal management, which required a capital outlay of $1,000,000. There is a hospital school for 100 boys, founded by Sir Humphrey Chetham, and incorporated by Charles II.; there is also a grammar school, having 166 foundation scholarships, founded in 1549 by Hugh Oldham, Bishop of Exeter. There are nearly 160 elementary schools, of which more than 60 are under the Manchester Board of Education; the others are denominational. In 1846, John Owens, a Manchester merchant, left £100,000 to found a college for secular instruction, which is now the oldest and most important of the three colleges affiliated with Victoria University, founded in 1880. In 1873 a new building was erected at a cost of about £90,000, and the Royal School of Medicine was incorporated with it, while the Natural History Society and the geological societies handed over their collections into its keeping; and again in 1884 other extensive buildings costing £90.000 were added. Manchester was among the first towns in England to adopt the Free Libraries Act, which allows an appropriation of a penny in the pound on the local assessment for parks, libraries, and museums; and here also was established the first free lending library in England. Numerous branch lending libraries and a museum have since been established in Manchester, and several branch lending libraries and an excellent museum in Salford; including the old college library, founded by Sir Humphrey Chetham, 1662, the people of Manchester and Salford have the free use of upward of 250,000 volumes.

The parks of Manchester are thirty-nine in number, covering an area of 1103 acres. The chief are Heaton Park, 692 acres; Boggart Hole Clough, 76 acres; Peel Park, and Whitworth Park. The city maintains an art gallery, and subsidizes a local college of music. Like Glasgow, it has a large precipitation and filtration plant for the utilization of its sewage (for description of plant, see GLASGOW), and for the prevention of pollution of its river. The fertilizers thus obtained bring a good price. The garbage is burned up in the furnaces, and the noncombustible part is used to fill in outlying low ground belonging to the city, which is thus converting it into good building land, which sells at an advanced price. Between the years 1880 and 1890 Manchester opened eight large bathing establishments at a cost of nearly $100,000 each. The corporation owns fifteen markets, in addition to slaughter houses, yielding a combined income of over $300,000 per year. After deducting all expenses, the city still retains over $80,000 as clear profit. Manchester has gone into municipal house building for working people. It lets several hundred dwellings in tenements, as well as private cottages to workmen's families, the rents being $2.50 per room per month, and about $5 per month for a four-room cottage. The death-rate in Manchester is quite high, it being, according to the latest available statistics, 25.65 per 1000 of population, or much higher than in London or Glasgow. As an industrial centre, it is one of the oldest, as well as one of the most important, in England. The chief industry is cotton spinning, weaving, and manufacturing, including calico printing, bleaching, and dyeing; there are also considerable manufactures of silk and mixed goods, of small wares, of machinery and tools, of paper and chemicals. Manchester is a depot for all kinds of textile fabrics, and has a very large export trade. It is the seat of an American consul.

The population of Manchester increased rapidly during the nineteenth century. Starting with a population of 75,000 in 1801, it grew to 126,000 in 1821, 303,000 in 1851, 505,400 in 1891, and 544,000 in 1901. In the adjoining borough of Salford the population in 1901 was 220,956, making a total for the two places of over 764,000. Within a radius of twenty miles from the Manchester town hall there is a cluster of towns with a total population of about 3,000,000, forming virtually one industrial community.

Roman remains have been found in great numbers at Manchester, but the history of the place can be traced only to Anglo-Saxon times, the name, Mamcester or Mameceaster, appearing in the Anglo-Saxon Chronicle in 923. The town suffered much from the Danes, but prospered nevertheless. In the thirteenth century fulling mills were at work there. In 1301 Manchester became a free borough with a considerable degree of self-government. It thrived especially after the fourteenth century, and about 1650 was a busy town, with nearly 6000 inhabitants. During the Civil War it was held successfully for the Parliament, but in the eighteenth century it became strongly Jacobite and participated in the rebellions of 1715 and 1745. In the early part of the nineteenth century, Manchester was prominent in the liberal and reform agitation, and was the scene, in 1819, of the so-called 'Peterloo Massacre' (q.v.). After 1832 it was the headquarters of the free-trade movement, and gave its name to the famous Manchester School of Economy.

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MANCHESTER. A town in Hartford County, Conn., 8 miles east of Hartford, on the Hockanum River and on the New England Railroad (Map: Connecticut, E 2). It was taken from East Hartford and incorporated in 1823, and includes the villages of Manchester, South Manchester, Buckland, Manchester Green, and Highland Park. The town is an important industrial centre, and has the great Cheney silk mills, paper mills, cotton and woolen mills, and manufactories of electrical appliances, needles, and tinware. There are public libraries in the villages of Manchester and South Manchester. Population, in 1890, 8222; in 1900, 10,601.

MANCHESTER. A city and the county-seat of Delaware County, Iowa, 46 miles west of Dubuque, on the Maquoketa River, and on the Illinois Central Railroad (Map: Iowa, F 2). It has a public library of about 3850 volumes, and, in the suburbs, a United States fish hatchery. The city is the commercial centre of the adjacent farming, stock-raising, and dairying country, and manufactures woolens, flour, carriages, brick and tile, fencing, etc. The industrial interests are promoted by good water power. Population, in 1890, 2344; in 1900, 2887.

MANCHESTER. A town including several villages in Essex County, Mass., 9 miles northeast of Salem, on Massachusetts Bay and on the Boston and Maine Railroad (Map: Massachusetts, F 2). It is a popular summer resort, one of the leading attractions being a Singing Beach. It has a public library in the Coolidge Memorial Library Building. The town owns and operates its waterworks. Population, in 1890, 1789; in 1900, 2522.

Manchester was settled probably as early as 1630, and was known as 'Jeffry's Creek' until 1645, when it was incorporated as a village under its present name. It first became a summer resort about 1845, when Richard H. Dana built a summer cottage here. Consult Lamson. *History of the Town of Manchester, 1645-1895* (Manchester, 1895).

MANCHESTER. The largest city of New Hampshire, and one of the county-seats of Hillsboro County, 18 miles south of the State capital, Concord, and 57 miles west-northwest of Boston, Mass., on the Merrimac River, at the confluence of the Piscataquog, and on the Boston and Maine Railroad (Map: New Hampshire, H 10). It extends along both banks of the two rivers. An immense amount of water power for manufacturing is derived from the Amoskeag Falls (about 55 feet) of the Merrimac by means of a carefully projected system of canals, though steam is used also in a number of the mills. The most extensive industry is cotton cloth manufacturing, the Amoskeag, Manchester, Amory, and Stark mills operating on a vast scale, and together employing over 13,000 hands. Manchester is noted for the production of fire engines and locomotives, and there are also paper and woolen mills, shoe factories, needle and knitting-machine factories, hosiery and underwear factories, carriage and wagon works, tanneries, and manufactories of cigars, brushes, beer, lumber products, furniture, etc. These industries, which employ about 19,000 persons, represent a capital of nearly $20,000,000, and have an output valued at more than that amount.

The city is well laid out with fine, broad streets, and has a handsome United States Government building, county court-house, State industrial school, Roman Catholic cathedral, a public library of over 45,000 volumes, and several public parks, in all embracing about 155 acres. Manchester spends annually, in maintenance and operation, nearly $650,000, the principal items of expenditure being about $120,000 for schools, $85,000 for the fire department, $60,000 for municipal lighting, $40,000 for the police department, and $25,000 for the waterworks, which are owned and operated by the city, having been built in 1873 at a cost of over $1,500,000. Population, in 1870, 23,536; in 1880, 32,630; in 1890, 44,126; in 1900, 56,987, including 24,257 persons of foreign birth.

Settled by Scotch-Irish in 1722, Manchester was known as Amoskeag and Harrytown until 1751, when it was incorporated as 'Derryfield.' In 1810 it received its present name, and in 1846 was chartered as a city. Consult Clarke, *Manchester, A Brief Record of Its Past and a Picture of Its Present* (Manchester, 1875).

MANCHESTER. A town and one of the county-seats of Bennington County, Vt., 52 miles northeast of Troy, N. Y., on the Battenkill River and on the Bennington and Rutland Railroad (Map: Vermont, C 9). It is a popular summer resort, situated amid fine mountain scenery, at the base of Mount Equinox (3816 feet above sea level), which commands a superb view, and has the Skinner Memorial Library of 16,000 volumes, and the Burr and Burton Seminary. There are four miles of marble sidewalk. The town is surrounded by a productive farming section, and has large lumber and marble interests, and manufactures of fishing-rods and ginger champagne. The water of the mineral springs here is exported. Before the organization of Vermont, Manchester was for many years claimed by both New Hampshire and New York. The town was incorporated in 1761 and the village in 1900. Population, in 1890, 1907; in 1900, 1955. Consult Munson, *The Early History of Manchester* (Manchester, 1876).

MANCHESTER. A city in Chesterfield County, Va., on the James River, opposite Richmond, and on the Southern, the Atlantic Coast Line, and the Seaboard Air Line railroads (Map: Virginia, G 4). It is connected with Richmond by several bridges, and enjoys a site of remarkable beauty. The city has important agricultural and coal-mining interests, and there are large flouring mills, cotton mills, foundries, paper mills, tanneries, brick yards, wooden-ware factories, etc., and repair shops of the Southern Railway. Good water power is afforded by the James River, which has a fall of 100 feet in less than six miles. The waterworks are owned and operated by the municipality. Population, in 1890, 9246; in 1900, 9715.

MANCHESTER COPPY. See Canary.

MANCHESTER SCHOOL OF POLITICAL ECONOMY. The name applied to a group of English economic writers under the leadership of Richard Cobden and John Bright, who advocated principles of free trade and *laissez faire.* In 1820 the merchants of Manchester became prominent as defenders of free trade, and in 1838 the Chamber of Commerce of Manchester issued a vigorous denunciation of the protective principle. The immediate object of attack was the Corn Law; and the Anti-Corn Law League, organized in 1839 by the Manchester free-traders, carried on an educational campaign which drew the attention of the whole world. The term 'Manchester School' has come to be applied as a term of reproach by writers of the German historical school of economics and by practical protectionists. It must be admitted that writers of the Manchester School often manifest a tendency to limit unduly the field of governmental activity and to overrate the beneficence of unrestricted competition. See the articles Free Trade; Corn Laws.

MAN′CHINEEL′ (Fr. *mancenille, manzanille,* from Sp. *manzanillo,* manchineel, diminutive of *manzana,* apple, probably from Lat. *matiana* (*mala*), *matian* (apples), nom. pl. of *Matianus,* relating to Matius, from *Matius,* name of a Roman gens), *Hippomane Mancinella.* A tropical American tree of the natural order Euphorbiaceæ. Its acrid milky juice is reputed very poisonous. The tropical American Indians poison their arrows with it. Its perfumed fruit, though milder than the other parts, is so acrid as to be inedible.

MANCHURIA, man-cho͞o′rê-ȧ (the land of the Manchus). The northeastern part of the Chinese Empire, situated east of Mongolia and the Argun River (which formerly traversed Manchurian territory), south of the Amur River (which separates it from Siberia), and west of the Usuri, which separates it from Primorsk (Maritime Province) or Russian Manchuria (a Chinese possession until 1860). It is bounded on the southeast and south by Korea, the Bay of Korea, and the Gulf of Liao-tung, and is included between the parallels of 39° and 53° 30′ N., and the meridians of 117° and 135° E. As already indicated, it was formerly much more extensive than it is now, Russian encroachments (beginning about the middle of the seventeenth century) having gradually narrowed it down to its present estimated area of 365,000 square miles. The country is known to the Chinese as Tung San Sŭng (or Shêng), i.e. the 'Three Eastern Provinces,' referring to its three administrative divisions: (1) The Province of Tsi-tsi-har or Hei-lung-kiang in the north, with an estimated area of 190,000 square miles; (2) Kirin (q.v.) in the centre, the original home of the Manchus, area 115,000 square miles; and (3) Shing-king or Fung-t'ien-fu in the south, area 60,000 square miles. This is, strictly speaking, no part of Manchuria, having been a Chinese province before the rise of the Manchus.

Topography. The whole eastern part of the country bordering on Korea and Russian Manchuria is occupied by huge mountain masses with many fertile valleys. The general trend of the ranges is from northeast to southwest, and the backbone of the whole is the Shan-a-lin or 'Long White Mountains.' In the northwest, within the loop formed by the Argun and the Amur, is found the main mass of the Greater Khingan (or Hingan) system, stretching southward into Mongolia, but sending out many spurs and ridges both westward toward Siberia and eastward through Tsi-tsi-har, forming in the centre of that province the hills and plateaus of the Lesser Khingan ranges. South of this (extending as far as the Gulf of Liao-tung) and west of the Shan-a-lin ranges lies the great plain of the country, diversified by hill and dale, with occasional swampy regions, but of great agricultural value, producing large crops of pulse, barley, wheat, millet, maize, rice, cotton, indigo, tobacco, sesame, opium, ginseng, rhubarb, etc., and capable of sustaining immense herds of cattle. It has been estimated that at present only one-fifth of the arable land is under cultivation.

The mountains are still well covered with forests, especially in the northern province, but those bordering on Korea are being rapidly denuded to supply the needs of China. Tigers, wolves, bears, deer, foxes, martens, and other fur-bearing animals abound, and hunting and trapping are important occupations. Agriculture, however, and the many minor industries connected with it, such as the manufacture of oil, oil-cake, etc., and the wild-silk industry, furnish employment for the bulk of the inhabitants.

Hydrography. The most important rivers drain northward to the Amur (q.v.). The two main drainage basins are those of the Sungari and the Usuri, both rising in the Shan-a-lin ranges. The former receives in its course the Nonni and the Hulan from the Khingan ranges, the Hur-ka or Mutan-hō from the Shan-a-lin, and many other streams. The Argun is navigable for 460 miles, the Sungari for 700 (not including its tributaries), and the Usuri for 250, but navigation is restricted by treaty to Russian and Chinese vessels. The south-flowing rivers are the Liao (400 miles), a continuation of the Shira-muren from Mongolia; the Ta-yang, entering the Gulf of Pe-chi-li at the small port of Taku-shan; and the Yalu-kiang (between Manchuria and Korea), which falls into the Bay of Korea.

Mineral Resources. Nothing is known regarding the geology of Manchuria, but its mineral wealth is known to be great. Gold is found in all the provinces, but most abundantly in Tsi-tsi-har. It is mined by the Government along the Sungari near San-sing as well as along the Hurka in the Province of Kirin. Silver, copper, and lead are known to exist, and coal, iron, and soda are worked to some extent.

The Climate exhibits great extremes of temperature, but is healthful, and, being uninfluenced by the southwest monsoon, it is dry. The rainfall is only about thirteen inches in the south. The minimum winter temperature varies from 7° F. below zero in the south to 40° F. below zero in the north, and the summer temperature sometimes reaches 95° F. The rainy season occurs in July and August.

TRANSPORTATION. There are many so-called 'highways,' but in some seasons of the year they are almost impassable. The chief movement of the crops takes place in winter, when the country is frozen solid, and thousands of pulse and grain laden carts and wagons stream southward day and night to the ports. There are now three railways in Manchuria: (1) from Shan-hai-kwan through Liao-si to Ying-tse and northward to Sin-ming-t'ing (and Mukden), 298 miles, built with British capital, guaranteed by the Imperial Chinese Government, and under the management of a British subject as engineer-in-chief; it cannot be alienated to any non-Chinese company or to any foreign Government; (2) a branch of the Russian Trans-Siberian Railway across Tsi-tsi-har and Kirin to Vladivostok; (3) the Central Manchurian Railway, running north 595 miles from Port Arthur and Dalny to Harbin on the above mentioned branch of the Trans-Siberian line; thus bringing Port Arthur and Niu-chwang into direct railway communication with Moscow and Saint Petersburg. The last two lines are really Russian Government railways, though nominally owned by a company called the 'Chinese Eastern Railway Company,' in which only Russians and Chinese can hold stock.

Telegraph lines now run in every direction; but the Imperial Postal Service is still confined to Government use.

COMMERCE. The commerce of the country is carried on chiefly at the ports of Niu-chwang, Port Arthur, and Dalny (qq.v.).

For administrative purposes Manchuria is divided into three provinces, of which the southern, Shing-king, has practically the same form of government as a province of China proper, except that it has only five boards for the transaction of public affairs instead of six, the board of civil office lacking. At the head of this province is a Governor-General, who is also the commander-in-chief of the provincial forces and high commissioner of the defenses of the whole territory of Manchuria. The remaining two governments have only a military form of government with a military governor at the head, who is under the supervision of the Governor-General of the southern province.

POPULATION. There are no census returns, and estimates differ widely. The most conservative make it from 5,530,000 to 12,500,000, 90 per cent. of which is Chinese. The original tribes still living in Manchuria probably form only one-twelfth of the population. For military purposes they are ranged under eight banners, and are consequently known as Bannermen. The language of the country is Chinese, which is also the only language taught in the schools. The Manchu language is now practically dead. An independent Manchu literature has never existed, the principal works in the language being versions of Chinese classics, history, etc. The alphabet consists of twenty-five letters (based on Mongol), six of which are vowels. They consist of certain marks and curves written on either side of a vertical stem, thus forming syllables, which are ranged in columns, read from left to right. Education is conducted entirely on Chinese lines, but the provincial and higher literary degrees are obtainable only on examination at Peking.

HISTORY. Many references are found in Chinese history to the savage tribes inhabiting this region even as early as the eleventh century B.C. In 712 we find a chieftain named *Ta*, whose tribe dwelt to the north of Korea, receiving from the Chinese Emperor the title of Prince of Pohai. Later his descendants threw off the Chinese allegiance and established an independent kingdom with a centralized government and no fewer than five royal residences. Later still arose the Khitan, whose seat was in the valleys of the Hulan. They conquered Eastern Mongolia, waged war on China, established a dynasty there known as the Liao (907), overthrew the Pohai in 926, and annexed their territory. In 1125 the Khitan were conquered by the Neu-chin or Jurchin, whose original seat was between the Upper Sungari and the Hurka, and who possessed themselves of Manchuria, Mongolia, and North China, and there set up the Kin or Golden dynasty. Driven out of China in the thirteenth century by Kublai Khan, the Jurchin became broken up into a number of independent tribes which were later welded into one kingdom by Nurhachu (born 1559), whose chief seat lay in the south of the Long White Mountain about 100 miles east of Mukden, then an important Chinese city. He was the seventh in descent from the miraculously conceived Aisin Gioro Bukuli, the ancestor of the family now on the throne of China, and the first to apply to his tribesmen the epithet *Manchu*, 'clear' or 'pure,' still used in the Chinese name of the reigning dynasty—*Ta Ts'ing Ch'ao*, 'the Great Pure.' In 1616 Nurhachu took the title of *T'ien-Ming*, 'Heaven-decreed,' and in the following year declared war on China, then in possession of both Liao-tung and Liao-si, defeated with immense slaughter an army of 200,000 sent against him, took Mukden in 1621, and on his capturing Liao-yang (which he made his capital) seventy cities surrendered to him. At his death in 1626 he was succeeded by his fourth son, who sent an army in 1627 into Korea, which had been aiding the Chinese, conquered it and exacted tribute, and advanced into Liao-si and Mongolia. Meanwhile decay had seized the Ming dynasty then on the throne of China; formidable rebellions existed everywhere; one of the rebel leaders had captured Peking, and the Emperor stabbed himself and his daughter. Wu San Kwei, the general operating against the Manchus in Liao-si, at once patched up a peace with them and invoked their assistance in restoring order in China. The Manchus agreed with great alacrity, marched into China, recovered Peking, and kept it (1644), placing the grandson of Nurhachu on the throne with the reign-title of Shun-chih (q.v.). For the subsequent history of Manchuria, especially in connection with the Boxer uprising of 1900 and the occupation of the country by Russia, see CHINESE EMPIRE.

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MANCHURIAN SUBREGION. One of the zoögeographical subdivisions of the Palearctic region, which embraces China north of the Yang-tse, Manchuria, Korea, and Japan (q.v.). It has the fauna of the plains and seacoasts of Eastern Asia. The mountains which separate it from the Siberian region permit many northern animals to stray far eastward along their lofty spurs; and the Manchurian fauna penetrates far westward along the intervening valleys and foothills. Its exclusive forms are few, and these are allied to Palearctic groups, and differ decidedly from the Oriental region to the southward. See Distribution of Animals, and accompanying maps.

MANCHUS, măn′chōōz. A people whose representatives have sat upon the throne of China since 1644. They belong by language and physical type to the Tungusic group of Siberian (Mongolian) peoples, whose habitat includes a large portion of Northeastern Asia between the Yenesei and the coast of the Pacific. The Manchus are rather tall with mesocephalic head-form. Up to the period of their conquest of China and their subsequent assumption to a large extent of Chinese culture, the Manchus seem to have been a rude, energetic, and warlike people, who adapted themselves to the tasks of empire with wonderful skill. They are, however, meeting the fate of so many conquerors. The infusion of Chinese blood in the Manchus is considerable, and they are gradually being absorbed by those whom their ancestors reduced to subjection. Their social characteristics, manners, and customs have been profoundly influenced, so that in these respects Manchuria is practically Chinese to-day. From the Chinese the Manchus have received the form of Buddhism they profess, through which, however, the original Shamanism frequently crops out. In contrast with the 'old Manchus' of Mukden, the term 'new Manchus' is applied to the recently subjected Mongol tribes of the Amur. Consult: Plath, *Die Völker der Mandschurei* (Göttingen, 1830-31); James, *The Long White Mountain* (London, 1888); Schrenck, *Reisen im Amur-Lande* (Saint Petersburg, 1881-91); Hosie, *Manchuria* (London, 1901).

MANCINELLI, män′chē-nĕl′lē, Luigi (1848—). An Italian composer and operatic conductor, born at Orvieto. He taught himself to play the piano and later studied the 'cello under Sbolci in Florence. In 1870 came the turning point in his career, with his engagement for the orchestra of the opera at Rome, under the famous Terziani. Within five years he had succeeded Terziani, and when the directorship of the Bologna Conservatory became vacant, in 1881, he was offered and accepted the position, and so revolutionized its methods that it rapidly rose to rank with the greatest music schools of Europe. His European fame as a conductor began at Drury Lane, England (1886-88), and was enhanced during his seven years at Madrid in a similar capacity. He produced his very successful opera seria *Ero e Leandro* there in 1897. At the conclusion of his service with the Madrid opera, he became associated with the grand opera undertakings of London and New York. His compositions are not numerous or well known. They include: Overture and entr'acte music to Cossa's *Cleopatra;* opera *Isora di Provenza* (1884); oratorio; songs; orchestral numbers, etc. It is on his ability as a conductor that his fame chiefly rests.

MANCINI, män-chē′nē. The name of five sisters, nieces of Cardinal Mazarin, who played a brilliant part at the French Court during the early reign of Louis XIV. They were born in Rome and spent their childhood in that city, but between 1647 and 1653 were summoned to Paris by Mazarin, who undertook the charge of their education and advanced their fortunes at Court. This 'battalion of nieces,' as Michelet calls them, comprised: (1) Laure (1636-57), a girl of amiable and pious disposition and the companion of the boy King Louis XIV. She became the wife of Louis de Vendôme, Duke de Mercœur, and died in childbed six years later. She was the mother of Louis, Duke de Vendôme, one of Louis XIV.'s greatest generals. (2) Marie (1639-c.1715); she came to Paris in 1653, and after some time was attached to the Court. She was brought up in the company of the young King, who conceived a violent passion for her and would have married her if it had not been for the interference of Cardinal Mazarin. In 1661 Mazarin gave her in marriage to Prince Colonna, the Constable of Naples, bestowing on her a dowry of a million livres. She left her husband in 1672 and in spite of a royal warning came to Fontainebleau, in the hope probably of reestablishing her old ascendency over the King. Forced to leave France, she traveled in Northern Italy and the Low Countries, and in 1674 took up her residence in Spain, where she enjoyed great influence with the Queen of Charles II. About 1705 she returned to Rome, where she died. Her memoirs, *Apologie*, were published in Leyden in 1678. (3) Olympe (1640-1708); she came to France in 1647, and her education was largely superintended by the Queen mother, Anne of Austria. She was witty and piquant and took a leading part in all the gayeties of the Court. In 1657 she married Eugène de Savoie-Carignan, Count of Soissons, and as mistress of the Queen's household lived for some time in close intimacy with the King, but, owing to her taste for intrigue, soon lost the royal favor. Suspected of complicity in the affair of the notorious poisoner La Voisin (q.v.), she left France, and passed the remainder of her life in stormy wanderings through the Low Countries, Spain, Germany, and England. She died at Brussels. Her son was the celebrated Prince Eugene of Savoy. (4) Hortense (1646-99); the most beautiful and admired of the sisters. She came to France in 1653, and after a two years' education in a convent was introduced into the royal circle. Among the aspirants for her hand at one time or another were Charles II. of England, then living in exile, and Peter II., the future King of Portugal. She married in 1661 the Marquis de la Meilleraye, who assumed the title of Duke of Mazarin after the death of the Cardinal. She left her husband in 1666, and in 1675 came to England, where her old adorer Charles II. gave her a pension. She became the centre of the gayest courtiers in the gay Court of the merry monarch, but lived in retirement after the Revolution of 1688. She died at Chelsea, near London. (5) Marie Anne (1649-1714); the wit of the family, and for a time the soul of all courtly festivities. She married in 1662 Godefroy Maurice de la Tour, Duke of Bouillon, became the patroness of La Fontaine, and made her home a meeting place for celebrities like Corneille and Molière. Implicated with her sister Olympe in the La Voisin affair, she lived away from Paris for a long time, but, returning in 1703, succeeded in regaining her old popularity. She died at Clichy. Consult: Renée, *Les nièces de Mazarin* (Paris, 1856); Chatelauze, *Louis XIV. et Marie Mancini* (Paris, 1880).

MANCINI, Pasquale Stanislao (1817-88). An Italian statesman and jurist, born at Castel Baronia, near Ariano, in Campania. He studied law at Naples, became professor of law at the university there when quite young, and in 1848 was deputy to the Neapolitan Parliament. On account of his liberal opinions, he had to flee Naples, went to Turin in 1849, and was made professor of public law at the university. When the Italian Kingdom became a fact, Mancini was made Minister in Rattazzi's Cabinet. After 1872 he was professor of criminal law at Rome. From 1876 to 1878 he was Minister of Justice and Education, and in this office procured the abolition of capital punishment, and showed himself an opponent of the Clerical Party. From 1881 to 1885 he was Minister of Foreign Affairs. Mancini was a brilliant orator, and a zealous advocate of Italian unity.

MANCIPLE'S TALE, The. One of Chaucer's Canterbury Tales. It is the story of the white crow turned black by Apollo for telling of the falseness of his wife, Coronis. It is found in Ovid's *Metamorphoses.*

MANCO CAPAC, măn'kō ka-păk'. The founder of the Inca dynasty in Peru, and according to tradition the survivor of four brothers, children of the sun, who came forth from the apertures of the dawn, i.e. from the eastern cordilleras of the Andes. He established himself at Cuzco with his sister-wife, Mama Oclla Huaco. He was supposed to have shown the people improvements in agriculture and architecture, and to have taught them the sciences and arts, by which means he acquired the leadership which was transmitted to his descendants.

MANCO IN'CA (?-1544). The last Peruvian ruler to oppose successfully the Spanish invasion of his country. He was the son of Huayna Capac (q.v.) and succeeded to the native headship after the murders of his brothers, Huascar and Atahualpa (1533), and tried to make friendly terms with the Spaniards, placing himself in their power. Pizarro treated him courteously and supervised his installation in accordance with the native rites. Manco, with a body of natives and Spanish auxiliaries, defeated the remnants of Atahualpa's armies, who were still maintaining the fight for independence against the Spaniards. Further acquaintaince with his new friends changed his ideas, however, and in April, 1536, Manco left Cuzco and called upon his people to rally and drive out the Spaniards. A fierce attack was made on Cuzco, during which most of the city was burnt, but the followers of Pizarro successfully defended their position. After a siege of five months, the Inca was compelled to retire, in order that his people might go home to sow their fields. He established himself at the stronghold of Ollantay-Tambo, in the Yucay Valley. There Pizarro tried to capture him, but the attack was repulsed, and the natives followed the Spaniards back to Cuzco, which was again besieged. The arrival of Spanish reënforcements from Mexico and Panama and the return of Almagro from Chile compelled the Inca to withdraw to the wild mountainous country between the rivers Apurimac and Vilcamayu, where he maintained his independence with a small body of his relatives and followers. Several renegade Spaniards, driven from Peru, sought refuge with him, and one of these killed the Inca during a sudden brawl, in 1544.

MANDÆ'ANS (from Mandaic *mandâ*, knowledge), also called Nasoreans, and, less correctly, Saint John's Christians. A religious sect which has flourished in Babylonia very possibly since the beginning of the Christian Era. At the present time the adherents of this faith live in the marshy lands near Basra, and in Khuzistan. The number of Mandæans was estimated by Petermann in 1854 to be about 1500, but Siouffi in 1880 found about 4000. Thévenot in 1663 counted 3279 families. Ignatius a Jesu asserted that there were 20,000 to 25,000 families in 1652, but he may have included many heretical Christians. At the time of Mohammed they were probably a considerable body, forming the most important part of the Sabians or Baptists (from the Aramaic root *saba*, to baptize), to which the Elkesaites and Hemerobaptists also seem to have belonged. From them Mohammed may have adopted the custom of washings before the daily prayers. Hence he and his followers were long known as Sabians. As a people possessing a written revelation they were accorded by Mohammed the same privileges as Jews and Christions. The Mandæans have nothing in common with the pagans of Harran, who to gain for themselves these privileges falsely claimed to be Sabians and were thus permitted to continue their idolatrous practices. Whether the Mandæans designated themselves in any other way than as *Mandaye*, i.e. *gnostikoi*, 'those who have the knowledge,' is not certain. Their religious views are known through their extant writings. Among these the most important are *Ginza*, 'the treasure,' also called *Sidra rabba*, 'the Great Book;' *Sidra de Yahya*, 'the Book of John,' also called *Derashe de malke*, 'Discourses of the Angels;' and *Ḳolasta*, 'Purity,' a collection of baptismal songs; there are also *Diwan*, 'the Book,' *Asfar Malwasha*, 'Signs of the Zodiac,' and a number of incantations. *Ginza* was published by Norberg from a Paris codex dated 1633, and more critically by Petermann from another Paris codex dated 1560. *Ḳolasta* was published by Euting from several manuscripts, the oldest of which was written in 1570. *Sidra de Yahya*, *Diwan*, and *Asfar Malwasha* exist only in late manuscripts. A large collection of incantations, all of recent date, have been published by Pognon. All of these writings are of composite authorship; they represent a long development, and the Mandæan religion is a mixture of many elements. The earliest parts of *Ginza* apparently present a purely pagan gnosticism, as yet uninfluenced by Jewish or Christian thought. Lagarde has pointed out that some of the sections showing familiarity with Judaism go back to a period when animal sacrifices were still practiced and the Christians were regarded as merely a Jewish sect, consequently to the first century A.D. Nöldeke has indicated some parts that must have been composed in the Sassanid period (226-651). But even *Ginza* and *Kolasta* contain many elements that are evidently later than Mohammed. It is probable that certain elements were at first borrowed from Christianity. Much old Babylonian and Persian speculation has also survived in Mandæanism. According to the orignal polytheistic doctrine, the soul belongs to a better world, the realm of the 'first life,' and is only temporarily attached to the body in the world of matter, in which the gods of light have chained the powers of darkness. This world is the creation of the powers of the 'second life,' who try to drag men down from the world of light. Through *Manda de Hayye*, the personified 'knowledge of life,' the soul may be brought back to its pristine state. An important symbol and means of purification is the holy lustration. The relations between these Baptists on the Euphrates and John the Baptist have not yet been cleared up. He maintains a position of honor among them, and this led to the name 'Christians of Saint John,' given by missionaries of the seventeenth century. Notwithstanding the Christian elements in their faith, they are bitterly hostile to certain Christian doctrines as well as to the Jews. They declare that *Jeshu Meshicha* (Jesus the Messiah) and his mother, *Rucha Ḳudscha* (the Holy Ghost), are evil spirits and the authors of all false religion. Efforts on the part of Nestorian missionaries to convert them may have caused this hostility. They have bishops, priests, and deacons, and admit women to these offices. They have a sort of Lord's Supper and observe Sunday and fasts. They are polygamous and command the marriage of priests. The Mandaic language belongs to the Aramaic branch of the Semitic family. It is only dialectically different from the language of the Babylonian Talmud, and probably represents the Aramaic speech of Babylonia from Upi to the Persian Gulf. Its syntax is particularly important. Even its vocabulary shows less foreign influence than the kindred Aramaic tongues. A grammar has been written by Nöldeke. The script is a form of the Syriac, closely akin to that which was carried to Manchuria and Mongolia by Mesopotamian missionaries. It seems to have been in use in the seventh and eighth centuries.

At present the Mandæans use the Arabic language. *Ginza* was translated into Latin by Norberg. Tychsen and De Sacy translated some sections of *Ḳolasta* and *Sidra de Yahya*. Large parts of *Ginza* have been rendered into German by Brandt. Some of the incantations have been translated by Pognon. The religion has been best described by Brandt. Consult: Zotenberg, *Catalogue des manuscripts syriaques et sabéens* (*mandaites*) *de la Bibliothèque Nationale* (Paris, 1874); Norberg, *Codex Nosaræus Liber Adami Appellatus* (Copenhagen, 1812-16); Petermann, *Thesaurus sive Liber Magnus* (Leipzig, 1867); Euting, *Qolasta oder Gesänge und Lehren von der Taufe und dem Ausgang der Seele* (Stuttgart, 1867); Nöldeke, *Mandäische Grammatik* (Halle, 1875); Brandt, *Die mandäische Religion* (Leipzig, 1867); id., *Mandäische Schriften übersetzt und erläutert* (Göttingen, 1893); Lagarde, *Mitteilungen*, iv., pp. 129 sqq. (ib., 1891); Pognon, *Incantations mandaïtes* (Paris, 1891-1901); Wellhausen, *Reste arabischen Heidentums* (2d ed., Berlin, 1897); Petermann, *Reisen im Orient*, vol. ii. (Leipzig, 1861); Siouffi, *Etudes sur la religion des Soubbas ou Sabéens* (Paris, 1880); Babelon, *Les Mandaïtes, leur histoire et leur doctrines* (Paris, 1882).

MANDALAY, măn′dȧ-lā. The capital of a district and division of Upper Burma, India, on the left bank of the Irrawaddy, 350 miles north of Rangoon, with which it has railway, river, and telegraphic communications, and 17 miles above Amarapura, which it replaced in 1860 as the capital of the former Kingdom of Burma (Map: Burma, C 2). Since the British occupation in 1885, the town has been greatly improved, a disastrous fire in 1892, which destroyed nearly the whole of the city, facilitating the necessary measures. It covers an area of six square miles, and is traversed by fine, shady, and well-lighted thoroughfares. It consists of the walled town, now called Fort Dufferin and used as the cantonment, inclosing the palace, the former residence of King Theebaw, the Government house, and the hall of justice, and the extra-mural town with its numerous temples, pagodas, and monasteries, and the grand bazaar noted for its wares and the heterogeneous and polyglot character of its habitués. Silk-weaving is the chief industry. Population, in 1891, 188,815; in 1901, 183,816.

MANDAMUS (Lat., we command). A writ or command of a court of competent jurisdiction in the name of the State, directed to an inferior court, an officer, corporation, or individual, requiring it or him to perform a public duty as required by law. Historically the writ of mandamus was at first a command of the sovereign and was without judicial character, hence it is that a mandamus is called a prerogative writ. As a purely prerogative writ its issuance was wholly a matter of discretion with the sovereign, and with its assumption of the judicial character the writ remains to some extent prerogative in the sense that it is granted at the discretion of the court. By discretion, however, is meant sound legal discretion; and the writ is now regarded as a remedy to be granted in a proper case according to well-settled legal principles. The writ is a purely legal and not an equitable remedy, although, in commanding things to be done, the court acts *in personam*, an exception to the usual practice of courts of law. See EQUITY.

It will be issued only when the petitioner is without adequate remedy at law, and then only to compel the performance of an official public duty which the officer, after demand, has refused or failed to perform. The duty must also be clear and undoubted, and it must be purely ministerial and not judicial or discretionary in character, for the court will not substitute for its discretion that of the officer.

The procedure upon the application for the writ and its issuance is now almost wholly regulated by statute. Consult: Spelling, *Treatise on Extraordinary Relief in Equity and Law* (2d ed., Boston, 1901); Wood, *Treatise on the Legal Remedies of Mandamus and Prohibition* (3d ed., Albany, 1893).

MAN′DAN. A city and the county-seat of Morton County, N. D., 5 miles from Bismarck, on the Missouri River, and on the Northern Pacific Railroad (Map: North Dakota, E 3).

It is in a coal-mining section, and carries on a trade in live stock, wool, and grain. There are railroad machine shops here, the city being a division point on the Northern Pacific. Mandan has the State Reform School and school for Indians. In the vicinity are prehistoric mounds of considerable interest. Population, in 1890, 1328; in 1900, 1658.

MANDAN. A noted and interesting tribe of Siouan stock (q.v.), now settled on Fort Berthold Reservation, at the junction of the Little Missouri with the Missouri River, North Dakota, in alliance with the Arikara (Ree) and Minitaree (Hidatsa or Gros Ventre, q.v.). They formerly lived much farther down the Missouri and were then a numerous and influential people, but their decline has been almost without parallel for its rapidity. About 1773 they occupied nine villages on both sides of the Missouri about the entrance of Heart River. Pressed by the Sioux and wasted by smallpox, they soon afterwards moved up the river, combining now into six villages. By 1804 they had again removed up the river, reduced now to two villages, and settled a few miles below the entrance of Knife River, in close neighborhood to their friends, the Arikara and Minitaree. Here they were found by the explorers Lewis and Clark, who wintered among them and have much to say of their friendly character. Here it was also that they were nearly exterminated in 1837 by the smallpox, which, brought first to their villages by a trading steamer, rapidly swept the whole plains, destroying thousands of victims and spreading death and terror among all the tribes from Canada to the Gulf. It is estimated to have killed from 6000 to 8000 of the great tribe of Blackfeet, and at least 2000 of the Pawnee, while the Mandan themselves were reduced in a few weeks from a tribe of about 1600 to a mere handful, reported, on what seems good authority, at 145 souls. Whatever may have been the true number, it was so small that they were lost sight of. The Arikara, who had lost about half their own number, moved into the untenanted Mandan villages, and for some years the Mandan tribe was thought by the traders to have become extinct. A few were still left, however, among the Arikara and Minitaree, and with rare determination they set about building up again their shattered tribal structure. They refused to adopt the language or customs of those with whom they lived, and made and strictly enforced a law forbidding all intermarriages with other tribes except upon condition that the foreign partner should become a member of a Mandan household and agree to rear his children in the Mandan language and rites. The result was that within ten years they were again a tribe, small but respected. In 1845 the Minitaree moved up the river to the present location at Fort Berthold, where the Mandan soon afterwards joined them, to be followed still later by the Arikara. The three allied tribes now number together 1100 souls, of whom the Mandan are 250.

In spite of their migrations, the Mandan were not properly a nomadic people, but lived in stockaded villages of large and substantial circular log houses with earth-covered roofs, similar to those of the Pawnee and other sedentary tribes along the Missouri River. They were agricultural; raising corn, tobacco, and sunflowers, besides going out upon the plains to hunt buffalo, at regular seasons. They tattooed upon the face and breast, and were usually designated as 'tattooed people' in the sign language. They used a peculiar circular boat, known as a bull-boat and much resembling a tub in shape, made of buffalo skins stretched over a willow frame. Among all the tribes they were noted for their elaborate ceremonials and particularly for the terrible self-imposed tortures of the great *Okeepa* rite, described by Catlin. The light complexion and hair frequently seen among them, the principal ground on which Catlin and others have tried to establish a theory of Welsh origin, is due partly to a species of albinism by no means rare in some tribes, but more to admixture of white blood.

MANDARA, mȧn-dä′rȧ, or **WANDALA,** wȧn-dä′lȧ. A small negro kingdom in Central Sudan, Africa, south of Lake Chad and tributary to Bornu (q.v.). It is a wild and densely forested mountain region. Its population numbers about 250,000 and consists of negroes professing Islam and advanced industrially to some extent. The chief town, Doloo, is fortified. Its population is 30,000. Since 1893 Mandara has belonged partly to the German and partly to the British sphere of influence.

MANDARIN (Port. *mandarim*, from Malay, Hind. *mantri*, councilor, from Skt. *mantrin*, councilor, from *mantra*, council, from *man*, to think). Any Chinese official, civil or military, who is entitled to wear a 'button' on his official hat. The term is entirely unknown to the Chinese, who speak of them officially as kwan. There are nine ranks, each distinguished by a different-colored ball or 'button' placed on the apex of the cap or hat, by a peculiar emblazonry on the breast (a bird in the case of a civil officer, and a wild beast in the case of military men), and a different clasp on the girdle. A mandarin is not allowed to hold office in his native province; he is not allowed to marry in the jurisdiction under his control, nor own land in it, nor have a near relative holding office under him; and he is seldom continued in office in a station or province for more than three years. It is incumbent on every provincial officer to report on the character and qualifications of all under him. The *Mandarin Dialect* is properly the language of the Court. During the present dynasty, it has been Pekingese; in some preceding dynasties it was the dialect spoken at Nanking. With slight variations, mandarin or *Kwan Hwa* is spoken over three-fourths of the country, as well as in Manchuria.

MANDARIN DUCK. The mandarin duck (*Aix galericulata*) is one of the most exquisitely colored of birds. It is a comparatively small species, about the size of a teal, and is very closely related to the common wood duck (*Aix sponsa*) of the United States. A native of China, it has been introduced as a semi-domesticated bird, for ornament, into Europe and the United States. It is beautifully variegated with green, chestnut, purple, and white, and fine black markings. In addition to the gorgeous coloration, certain peculiarities of plumage on the head, neck, and wings add greatly to the beauty. The mandarin duck is said to be remarkable for being monogamous, and for remaining paired throughout life; it is an object of veneration to the Chinese, as an example of conjugal fidelity.

MANDATE (from Lat. *mandatum*, command, from *mandare*, to command, from *manus*, hand + *dare*, to give). (1) In law, an undertaking by virtue of which one becomes the gratuitous agent of another. The term is derived from the Roman law, under which the mandate was the first form of agency recognized.

(2) The term mandate is also applied to a bailment made for the sole benefit of the bailor. See BAILMENT. Consult the authorities referred to under the titles AGENT; BAILMENT.

(3) In the law of procedure the term mandate is loosely applied to any judicial command.

MANDAUE, mȧn-dou'*e*. A town of Cebú, Philippines. It is situated on the eastern coast of the island, near the north entrance to Cebú Channel, and four miles northeast of the town of Cebú (Map: Philippine Islands, J 9). Population, in 1896, 10,556.

MANDAYA, mȧn-dä'yȧ. A wild Malay people in southeastern Mindanao. See PHILIPPINE ISLANDS.

MANDEL, män'del, EDUARD (1810-82). A distinguished German engraver, born in Berlin, where he studied at the Academy under Maré and Buchhorn. The success of his first important plate, after Hildebrandt's "The Warrior and His Child" (1835), brought him the commission from the Prussian Art Union to engrave "Loreley" after Begas, and in 1837 his election to the Academy. He completed his studies in Paris (1839-40) under Henriquel-Dupont, and in 1842 was appointed professor at the school of engraving connected with the Berlin Academy. He was one of the chief masters of modern engraving and the most eminent representative, during the nineteenth century, of pure line engraving in Germany, unequaled as regards correct drawing, minute exactness in reproducing the style of the original, and plastic vigor. His most admired plates include: "Van Dyck's Portrait of Himself" (1841); "Titian's Portrait of Himself" (1843); "The Great Elector" (1846); Raphael's "Madonna Colonna" (1855) and "Madonna della Sedia" (1865); "La Bella di Tiziano" (1868); but above all Raphael's "Madonna di San Sisto," the crowning effort of his life, completed shortly before his death and incomparably superior to the best previous reproductions of that master's work. Consult Pietsch, *Eduard Mandel und seine Werke* (Berlin, 1883).

MANDELGREN, män'del-grĕn, NILS MÅNSSON (1813—). A Swedish critic, born at Ingelträde (Skaane). He was a student at Stockholm and Copenhagen, and afterwards obtained a pension from the Government for his archæological services (1873). In 1851 he went to Paris and there wrote his *Monuments scandinaves du moyen-âge* (1855-62). He did much to encourage industrial art in Sweden and assisted in the foundation of the Swedish Society of Industrial Arts (1844). His other writings include *Samlinger till svenska konst- och odlingshistorian* (1866).

MANDER, män'dĕr, KARL VAN (1548-1606). A Dutch painter and author, born in Meulebeke, in Flanders, of a noble family. He was well educated, studied art and poetry under Lucas de Heere in Ghent, and painting with Vlerick in Courtray, and spent three or four years (1573-77) in Italy, mainly at Rome, working with Spranger. At Amsterdam he established with Goltzius an art school, of which Franz Hals was the most famous pupil, and he became head of a circle of poets. His literary activity almost entirely overshadowed his paintings, which are scarce, artificial, and of no great excellence. Among them are a "Deluge," at Schleissheim; "Portrait of a Man," in Vienna; and possibly "Juda and Tamar," in Brunswick. His original poetry was printed in 1597 under the title *De gulden harp*. He translated Vergil's *Bucolics* and *Georgics* (1597), and, from the French, twelve books of the *Iliad* (1611). But his most important work was *Het schilderboek* (1604), a biographical lexicon of painters, practically the sole authority for Flemish art from 1366 to 1604. A French version was printed in Paris (1885). Consult Plettinck, *Studien over Karel van Mander* (Ghent; 2d ed. 1887).

MAN'DERSON, CHARLES FREDERICK (1837—). An American soldier and politician, born in Philadelphia. He removed in 1856 to Canton, Ohio, where, in 1859, he was admitted to the bar, and at the outbreak of the Civil War enlisted as a private in the Federal Army. He rose to the rank of brigadier-general of volunteers, and resigned in April, 1865, because of his wounds. In 1869 he removed to Omaha, Neb., and was for six years city attorney; was a member of the constitutional convention in 1871, and again in 1874, and of the United States Senate as a Republican from 1883 till 1895. He was president *pro tem.* of the Senate for the Fifty-first and the Fifty-second Congresses (1891-95). In 1900-01 he was president of the American Bar Association.

MANDEVILLE, măn'de-vĭl, BERNARD (1670?-1733). Author of the *Fable of the Bees*, born in Dort (or Dordrecht), Holland, about 1670. In a thesis maintained at Leyden, March 23, 1689, and entitled "De Brutorum Operationibus," he argued that brutes act automatically—a theory of Descartes and of the older theology. Having taken his degree in medicine at Leyden, he settled in London as a physician. Never gaining much practice, he received, it is said, a pension from Dutch merchants. He died in London, January 21, 1733. His famous book, a doggerel pamphlet, first appeared under the title *The Grumbling Hives, or Knaves Turned Honest* (1705). It was republished in 1714, with the title *The Fable of the Bees, or Private Vices Public Benefits*. A second edition with additions (1723) was presented as a nuisance by the grand jury of Middlesex. A second part appeared in 1728. Mandeville attempted to prove, perhaps with irony, that 'private vices are public benefits;' that waste, luxury, and profligacy are good things for a State. His audacious thesis led to a sharp controversy, in which Bishop Berkeley took a hand (*Alciphron*, 1732). Among Mandeville's other works are: *Esop Dressed, or a Collection of Fables Writ in Familiar Verse* (1704); *Free Thoughts on Religion* (1720); and *An Enquiry Into the Causes of the Frequent Executions at Tyburn* (1725).

MANDEVILLE, THE TRAVELS OF SIR JOHN. The title of a famous itinerary and collection of marvels, composed in the third quarter of the fourteenth century. The book opens and closes with delightful fragments of an apocryphal autobiography. The author claims to be one John Mandeville, born at Saint Albans, who crossed the sea in 1322 and traveled through Tartary, Persia, Armenia, Africa, Chaldea, Ethiopia, Amazonia, and India. On his return, he stopped at Rome, where his 'book was proved for true' by the Pope's council. He adds that he first wrote it in Latin and then turned it into French and English (1356). Until very recently all these statements were accepted as facts. It now seems clear that of the versions named, the French (1371) is the oldest, and that from it were derived the others (early part of fifteenth century). Though the writer of the French original may have traveled in the East, his work is mainly a compilation from the travels of a German knight, William of Boldensele (1336), the journal of Friar Odoric (1330), the journey of Johannes de Plano Carpini, a Papal envoy to the Tatars (about 1250), the history of the East by Hetum, the Armenian (1307), other itineraries, and the mediæval *specula*. He drew upon Pliny, Solinus, Peter Comestor, Vincent of Beauvois, Brunell-Latine, and Jacques de Vitry. With little doubt, the compiler of the work was Jean de Bourgogne dit à la Barbe (John of Burgoyne with the Beard), who died at Liège in 1372. He may have been the John of Burgoyne who likely quitted England in 1322, and had good reasons for living under an assumed name. The *Travels of Sir John Mandeville*, abounding in marvels, has delighted many generations. Of the work, there are three English versions extant in at least thirty-four manuscripts. From the poorest were printed the fifteen editions from 1499 to 1725. A better version, edited anonymously in 1725, was carelessly reprinted by Halliwell (London, 1839-68), and edited, with modern spelling, by Wright, in *Early Travels in Palestine* (ib., 1848); by Morley (ib., 1886); and, with three illustrative narratives, by Pollard (ib., 1900). A third version (northern dialect) was edited by G. F. Warner for the Roxburghe Club (Edinburgh, 1889).

MANDINGO (native name, *Mande-nga*). An extensive linguistic group of negroes more or less mixed with Hamites, dwelling in Western Africa from the Senegal and Upper Niger to Monrovia, and numbering many millions. Physically they are spare and athletic; height, 1.700 millimeters or 67 inches; the cranial index or proportion of head width to head length is 75.5-78.8. They frequently have aquiline noses and features distinct from the negro, though the hair is woolly. In their food, dress, and habitations they are far above savagery, and, under Arab teachers, have attained a certain degree of culture. The speech, called Mandi, is widespread, and divided into many dialects, encircling Timbuktu and enroaching on Fulah and Hausa. About seven hundred years ago the Empire of Mali was founded by the ancestors of this people in the Upper Niger region, and under King Musa (1311-31) it covered the Gambia and Joliba basins. The Upper Niger tribes still call themselves Mali'-nke. In religion they are Mohammedan, having embraced that faith centuries ago and propagated it with great vigor. The Mandingos were divided into numberless tribes, each speaking its own dialect, and, through their lack of cohesion, they were conquered about 1500 by the Sonrhay. The English planted factories among them in 1618, but the expeditions into the Niger country ended in disaster. The French in the next century cut off the progress of the English. In 1862 the Gambia Mandingos waged a propaganda for Islam in which hundreds of settlements of pagan tribes on the Gambia were laid waste.

MAN'DIOC. A starch-producing euphorbiaceous plant. See CASSAVA.

MANDOLIN (Fr. *mandoline*, from It. *mandolina*, diminutive of *mandola*, *mandora*, variants of *pandora*, sort of lute, from Gk. *πανδοῦρα*, *pandoura*, Osset. *fändur*, Arm. *pándiṙ*, stringed instrument, of Lydian origin). A musical instrument of the lute species. The body of the mandolin is shaped like a shell, formed of a number of narrow pieces of different kinds of wood, bent into the shape, and glued together. On the open portion of the body is fixed the sounding-board, with a finger-board and neck like a guitar. The Neapolitan mandolin, which is the most perfect, has four double strings, which are tuned, beginning with the lowest, g, d^1, a^1, e^2. The Milanese mandolin has six strings, tuned g, b, e^1, a^1, d^2, e^2. In Spain the mandolin is built with six double strings tuned g♯, c^1♯, f^1♯, b^1, e^2, a^2. There is also a Turkish mandolin, which has seven double strings. The kind of mandolin most generally used to-day is the Neapolitan. Its range is g-e^3. The strings are struck by a plectrum held in the right hand, while the fingers of the left hand regulate the notes as on the violin. As the instrument cannot sustain long notes, it is customary to play all such as a tremolo, just as is sometimes done on the piano by the rapid change of fingers on the same note. Although the mandolin has never been an orchestral instrument, operatic composers have occasionally employed it to obtain characteristic effects.

MANDRAKE (ME. *mandrake*, *mondrake*, *mandrag*, *mandrage*, *mandragora*, from Lat. *mandragoras*, from Gk. *μανδραγόρας*, *mandragoras*; influenced by popular etymology with *man* + *drake*, dragon, in allusion to the shape of the root and its supposed aphrodisiac qualities), *Mandragora*. A genus of plants of the natural order Solanaceæ. Two species are described by some botanists, the autumnal mandrake (*Mandragora autumnalis*), which flowers in autumn, and has lanceolate

MANDRAKE (*Mandragora officinarum*).

leaves and ovate berries; and the vernal mandrake (*Mandragora officinarum*), which flowers in spring, and has oblong ovate leaves and globose berries. Both are natives of the south of Europe and of the East. The root, which often crudely resembles the human figure, is large and carrot-like, and from it the leaves spring with no apparent stem, and among them the stalked whitish flowers. The plant has a fetid, narcotic smell and is reputed poisonous. From ancient times, aphrodisiac virtues have been ascribed to the mandrake, which was therefore supposed to cure barrenness. (See Gen. xxx. 14-16.) In the United States the name mandrake is often applied to the May-apple (*Podophyllum peltatum*), a low-growing perennial plant, the fruiting stem of which divides about a foot from the ground, each branch bearing a large peltate leaf and between them the yellow, fleshy fruit, about the size of a plum. The dried rootstalk is used in medicine.

MANDRIL, or **MANDREL** (from Fr. *mandrin*, mandrel, from Lat. *mandra*, Gk. *μάνδρα*, stall, bed for insertion of the stone of a ring). A bar of metal inserted in a piece of work to form it, or to hold it during the process of manufacture, as in a lathe, or the spindle which carries the chuck of a lathe, and communicates motion to the work.

MANDRILL. A baboon (*Cynocephalus mormon*), the largest of the tribe, and perhaps the ugliest in features and disposition. It is nearly related to the drill, and its characteristics are fully described under BABOON. Little is known of the geographical range of this animal, or of its habits in a wild state, although its existence was known to the ancients. It can be tamed when taken young, and a few which have been kept in European zoölogical gardens have shown much intelligence under training, but few pleasant traits. See Plate of BABOONS.

MANDURIA, mȧn-dōō'rê-ȧ. An ancient town in the Province of Lecce, South Italy, situated about 23 miles west of Lecce and about the same distance southeast of Taranto (Map: Italy, M 7). It has some relics of antiquity. Olives, wine, grain, and fruit are the chief products. The place is of Greek origin. Population, in 1901 (including Uggiano Montefusco), 13,113.

MANDVI, mänd'vē'. A seaport of the native State of Cutch, Bombay, India, on the northern shore of the Gulf of Cutch, 180 miles southeast of Karachi (Map: India, A 4). Though there is no regular landing-place, boats of any size can land at the sandy beach, and large vessels find secure anchorage in the offing. Mandvi has direct steamship communication with Bombay; its trade was strongly affected by the recent famine, which also accounts for the decrease in its population. Population, in 1891, 38,155; in 1901, 24,683.

MAN-EATER SHARK. A shark which is known or believed to devour men; specifically, the great 'white' or 'blue' shark (*Carcharodon carcharias*, or *Rondeleti*) of the family Lamnidæ. This is one of the largest of the sharks, reaching a length of 30 or 40 feet. It frequents all temperate and tropical seas, and is occasionally taken on both the Atlantic and Pacific coasts of the United States. Its body is stout, and the caudal fin large and strong, giving great swimming power; the nose is square and pointed, the eyes prominent, the mouth very large and armed in both jaws with five rows of triangular teeth, which are peculiar in being serrated. In a specimen 36½ feet long, it is recorded, the teeth measured 1¾ inches across the base. There have frequently been dredged in the Central Pacific Carcharodon teeth 4 inches across the base, indicating sharks more than twice as large; and it is believed that the owners of these teeth were living within a comparatively recent period. The color of the skin is by no means 'white,' but of the hue of lead, with the tips of the pectoral fins black. This monster ranges the seas seizing and devouring whatever it is able to overcome; a specimen taken in California had a young sea-lion weighing 100 pounds in its paunch. Like other sharks, they follow ships for many days, feeding upon the offal thrown overboard, and upon other fishes attracted by the same bait. That the larger ones might easily bite off the leg or even the whole body of a man is not to be doubted; and unquestionably many such casualties have occurred to persons in tropical seas, although experienced swimmers, such as the pearl-divers, profess to fear them little, being able to frighten them away, or avoid their rush, and even to stab them to death with a knife.

The earliest remains of this genus of sharks have been found in the Upper Cretaceous beds of Texas. In the Eocene marls of the Atlantic and Gulf coasts, especially in New Jersey and North Carolina, the teeth of Carcharodon are quite abundant and form an important source of the phosphate on account of which the deposits are mined. These fossil teeth often attain a size of six inches in width at the base and six and one-half inches in height. This implies an owner fully 100 feet in length. Contemporary with this predecessor of the present species was another, distinguished by having a little projection or 'ear' on each side of each tooth near its base, and this attained a length of 50 or 60 feet, and must have aided its larger relative in clearing the Miocene ocean of Zeuglodon and other great marine reptiles. They swarmed, as is known from the frequency of their teeth in the Tertiary deposits of many parts of the world, and seem to have been especially numerous along our southeastern coast. The teeth of these, as well as of modern sharks, also abound on the floor of the deeper parts of the present oceans.

MANED WOLF, or RED WOLF. An extraordinary wolf-like animal (*Canis jubatus*), regarded as the only true wolf in South America, and held by some naturalists to be entitled to generic distinction. It inhabits Brazil, Paraguay, and Northern Argentina, but does not extend south of the borders of the Pampas. It is about the size of the common wolf, but not so heavy, its height being due to its long, ungainly legs, which give it a peculiar stilted appearance. (See Plate of WOLVES AND WILD DOGS.) It has a rather slender, pointed head, long ears, and comparatively short tail. The general color is bright yellowish red, with a black patch on the nape of the neck, another on the lower jaw, and one on each foot, forming conspicuous black 'stockings.' This aspect and its habits seem to remove it from the company of the true wolves and to place it nearer the 'fox dogs' (q.v.). It never assembles in packs, but lives in the forest in pairs and hunts entirely alone. It is nocturnal, secretive, timid, and rarely seen, and is feared by nobody. It will sometimes attack deer or sheep, but lives mainly upon small rodents. It also catches birds, reptiles, insects, and even eats fruits. An interesting account of this animal in captivity, accompanied by portraits, was written by Joseph Gleeson, in the *Century Magazine* for September, 1902.

MANES, mā'nēz (Lat. nom. pl., OLat. *manis*, *manus*, good, in full, *Di Manes*, the good gods). A somewhat indefinite appellation given by the Romans to the powers of the lower world. In the earlier religious conception the term seems to be used without special reference to the souls of the departed and to denote rather the deities concerned with the realm of the dead. They are, therefore, invoked in all ceremonies which concern the dead, and on such occasions as the 'devotion' of P. Decius Mus to the gods of the lower world, or in curses. Later, in Imperial times, we find them conceived as deified souls like the earlier *Di parentum*, and on monuments the letters D. M. (*Dis Manibus*) apparently dedicate the spot to them. Consult: Steuding, s. v. Manes, in Roscher's *Lexikon der griechischen und römischen Mythologie* (Leipzig, 1894-97), and Wissowa, *Religion und Kultus der Römer* (Munich, 1902).

MANES. The founder of Manichæism. See MANI; MANICHÆISM.

MANET, mȧ'nȧ', EDOUARD (1833-83). A French genre and portrait painter, the founder of the Impressionist School. He was born at Paris, of a family of magistrates, who desired him to follow the same career. After completing his studies at the Collège Rollin, at Paris, he was sent to Rio de Janeiro, in the hope of changing his determination to become a painter. Persisting in his design, upon his return to Paris in 1850 he entered the studio of Couture, with whom he worked six years. He then traveled in Germany, Holland, and Italy, studying the old masters, especially the works of Tintoretto at Venice, whose influence is evident in a series of religious pictures painted about this time. He eventually evolved a style of his own, which broke absolutely with tradition, and revolutionized modern painting. One chief characteristic of this style is the substitution of actual values of color (q.v.), as they are in nature, for the relative or corresponding values of the studio. (See IMPRESSIONIST SCHOOL OF PAINTING.) Another was a broad execution, in which he gave the predominating local color, ignoring the minor variations, thus giving the general effect, to the effacement of detail and modeling.

Among the best known of his early works were: the "Absinthe Drinker" (1860), showing the influence of Couture; "Boy with a Sword" (1860), Metropolitan Museum, New York; "Guitar Player" (1861); the "Fifer;" "Le bon bock," a portrait of the engraver Belot enjoying a glass of beer. His "Déjeuner sur l'herbe" ("Breakfast on the Grass"), in which two nude female figures were contrasted with clothed men, raised a storm of misdirected indignation. His other works include: a "Dead Christ and Angels," "Olympia" (1865); "Music Lesson" (1870); the "Garden" (1870), his first real *plein air* painting; the "Railroad" (1874); "Nana" (1876); "Bar at Folies-Bergère" (1882); "Jeanne" (1882). He also executed a number of pastels, and engraved a series of his works (published, 1874), besides illustrating Cros's *Le fleuve*, Champfleury's *Les chats*, and Poe's *Raven*.

Painting of so revolutionary a character raised much criticism, in which Manet's part was ably taken by his friend Zola. His frequent choice of subjects from low life also militated against his popularity. The Salon was usually closed against him and he was forced to hold separate exhibitions. He did not receive the Legion of Honor till 1882, and not until after his death was his importance fully realized. He was a highly cultured man, of great wit and social charms. His death occurred at Paris, April 30, 1883.

Consult: Zola, *Edouard Manet: Etude biographique et critique* (Paris, 1867); and the biographies by Basire (Paris, 1884); Gonse, *Gazette des Beaux-Arts*, vol. i. (1884); Beckwith, in Van Dyke, *Modern French Masters* (New York, 1896).

MANETENERI, mä'nȧ-tȧ-nä'rē. A tribe of Arawakan stock (q.v.) residing upon the Upper Purus and Juruá, southern affluents of the Amazon, on the Brazil-Bolivia frontier. They are a river people, constantly on the move in great canoes of cedar wood. They weave cotton cloth and use iron axes and fish-hooks.

MAN'ETHO (Lat., from Gk. **Μανεθών**, *Manethōn*). The most important of all classical writers who have treated the history of ancient Egypt. He is said to have been a native of Sebennytus in the Delta, a high priest (of Heliopolis or Sebennytus), and scribe of the temples of Egypt; i.e. a president or secretary of the priestly assemblies. He appears as representative of the Egyptian priesthood and Egyptian learning under Ptolemy I., Soter, when he and the Athenian priest Timotheus were the only scholars able to identify as Serapis the statue of an unknown god brought from Sinope to Alexandria. It is certain that Manetho's principal work, the *Egyptian History*, was written, however, under Ptolemy II. Philadelphus, as it contains a reference to the Arsinoite nome (i.e. the Fayum), and must therefore be later than B.C. 273, the date of the marriage of Ptolemy II. with his sister Arsinoë. This history, in three books, has become famous, for it was the only work in Greek based on a full knowledge of the Egyptian sources. A more doubtful tradition states that Ptolemy II. himself selected Manetho as the Egyptian scholar who possessed the most profound Greek scholarship, and ordered him to write the history of the country. Manetho undoubtedly possessed as much knowledge of Egyptian history as could be expected of any Egyptian priest, and he followed chiefly the native sources, inserting occasional polemics against the errors of Herodotus and others. Nevertheless, his work is marred by the introduction of some mythological Greek names and other matters.

Manetho's work does not seem to have been much read outside of Egypt, though it played an important part in the controversy between Josephus and Apion, near the end of the first century A.D. Later, the Christian chronographers made considerable use of it in arranging the biblical chronology, but it is questionable if they had the complete work. Thus we have only a few passages of the history quoted in Josephus, and the chronological tables in Julius Africanus and

Eusebius, both tables preserved only in the work of George Syncellus of Byzantium (A.D. 792), and in the so-called *Excerpta Barbari* (in Latin). These extracts have come down to us in such a mutilated form that it is very difficult to form an opinion of the value of the original book. The earlier Egyptologists overrated the importance of this authority, and lately it has been treated with the greatest skepticism. Not only have the names and dates been corrupted to a large extent, but Manetho undoubtedly did not possess sufficient sources of information to make his book absolutely reliable. Nevertheless, we still retain his division of Egyptian history into thirty dynasties from Menes (before whom the fabulous reigns of gods, demigods, and manes are enumerated) to Alexander, although this division is recognized to be merely conventional in more than one case. The old discussion, as to whether the dynasties of Manetho were all consecutive or whether some were contemporaneous, has been settled in favor of the second theory, although it applies only to a few cases (e.g. Dynasties fifteen to seventeen). The Sothiac cycle of 1460 years (at the end of which the short civil year of the Egyptians and the correct astronomical or Julian calendar again coincided), followed by Manetho in his chronological arrangement, has been of little use to modern scholars, owing to the fragmentary condition of the extracts. It is often possible to correct the errors of Manetho by the aid of the monuments. Consult: Boekh, *Manetho* (Berlin, 1845); Unger, *Chronologie des Manetho* (Berlin, 1867); handy editions of the text in Bunsen, *Egypt's Place in Universal History*, translation, vol. i. (London, 1848-67); and in C. Müller (ed.), *Historici Græci Minores* (2 vols., Leipzig, 1870-71). Manetho is said to have also written: *A Compendium of Natural Science; Concerning Feasts; On the Preparation of Kyphi* (i.e. aromatic frankincense). Whether these works were spurious, as is undoubtedly the *Apotelesmata*, an astronomical work of the Christian time, cannot be determined; another 'Manethonian' book, the *Sothis* (i.e. dog star), is clearly spurious, as it is dedicated to the Emperor Augustus.

MANETTI, mȧ-nĕt'tê, GIANOZZO. An Italian humanist. See GIANOZZO MANETTI.

MAN'FRED (c.1232-66). King of Naples and Sicily from 1258 to 1266. He was a natural son of the Emperor Frederick II. On his father's death, in 1250, he received the Principality of Tarentum, and in the absence of his half-brother, Conrad IV., acted as regent in Italy. After Conrad's death, he was acknowledged regent of Apulia for his nephew Conradin (q.v.). Pope Alexander IV. caused a crusade to be preached against him, but Manfred, steadily pursuing his victorious career, became, in 1257, master of the whole Kingdom of Naples and Sicily. On the rumor of Conradin's death he was crowned King of Palermo, August 10, 1258, and immediately afterwards was excommunicated by the Pope, together with his adherents, among whom were the first prelates of the Kingdom. Manfred invaded the Papal dominions, levied heavy contributions from them, and made himself master of the whole of Tuscany. His power now seemed secure, especially as he married his daughter Constance to Peter of Aragon, while he himself married the sister of the Greek Emperor Theophilus. His government was at once mild and vigorous; he founded many schools, built towns and harbors, and labored in many ways for the improvement of his Kingdom. But this tranquillity was not of long duration. Pope Urban IV. renewed the excommunication against him and his friends, and bestowed his dominions as a Papal fief on Charles of Anjou, the brother of Louis IX. of France. Manfred, though at first successful in the war which ensued, was at last defeated and slain in a bloody battle at Benevento, February 26, 1266. His widow and children were savagely treated by the French, the daughter being imprisoned for seventeen years and the sons dying in captivity. His body, as that of an excommunicated person, was interred on the battlefield under a heap of stones. Consult Schirrmacher, *Geschichte der letzten Hohenstaufen*, vol. iv. (5th ed., Leipzig, 1878). See CHARLES OF ANJOU.

MANFRED. A dramatic poem by Byron (1817). Count Manfred, a kind of magician, dwelt in the Alps in solitary misery. Superhuman in his nature, he was so in his suffering. Schumann composed a musical setting of the poem, which was performed under Liszt's direction at Weimar in 1852. A version of *Manfred* was produced upon the stage in England in 1863.

MAN'FREDO'NIA, *It. pron.* măn'frâ-dō'nê-ȧ. A town in the Province of Foggia, Italy, 23 miles northeast of the city of Foggia (Map: Italy, L 6). It is strongly walled, and an imposing castle protects its port, which is accessible only to small vessels. Two miles west of the town are the ruins of ancient Sipontum, of which the Cathedral of Santa Maria Maggiore, an edifice in the Romanesque style, has been partly restored. In the vicinity of Manfredonia are some remarkable salt lakes; figs, almonds, and carobs are extensively exported. The town dates from 1263, but its industrial growth was checked by the Turks, who pillaged it in 1620. Population, in 1901 (commune), 12,188.

MANGABEY, măn'gȧ-bĭ (a geographical name in Madagascar, erroneously applied by Buffon to an animal which is not found in the island). Any one of a group of three or four species of West African monkeys forming the genus Cercocebus, which is related to the guenons on one side and to the macaques on the other. They are distinguished by peculiarities of dentition; by the backward direction of the hairs of the crown, and strikingly by having white eyelids; wherefore they are frequently called 'white-eyelid monkeys.' One well-known species, common in zoölogical gardens (where it is hardy and develops many amusing and gentle traits) is the sooty mangabey (*Cercocebus fuliginosus*). It is sooty black in color, and has the singular habit of carrying its tail always thrown forward over its back. See Plate of MONKEYS OF THE OLD WORLD.

MANGALDÁN, măn'gȧl-dăn'. A town of Luzon, Philippines, in the Province of Pangasinán, situated near the south shore of the Gulf of Lingayén, about 13 miles northeast of Lingayén (Map: Philippine Islands, E 3). It is connected by highroads with the principal places of the province and is to be on the proposed northern extension of the Manila-Dagupán Railroad. Population, in 1896, 16,143.

MANGALORE, măṉ'gȧ-lōr', or **MANGALUR**, măṉ'gȧ-lo͞or'. The capital of the district of South Kanara, Madras, British India, 407 miles south-southeast of Bombay, on the Arabian Sea (Map: India, B 6). The residential section of the city is pleasantly situated on several hills which afford an extensive view of the sea and the thickly forested surrounding region. It has a German mission where instruction is given in the different crafts, and is the seat of a Government college and the Jesuit College of Saint Aloysius, both of which are connected with Madras University. A large trade is carried on in coffee, nuts, and pepper, and various grades of cloth are manufactured. Mangalore is renowned for the brave resistance its little garrison offered the army of Tippu Sahib in 1782-83. Population, in 1891, 40,922; in 1901, 44,108.

MAN'GAN, JAMES (known as JAMES CLARENCE MANGAN) (1803-49). An Irish poet, born in Dublin, May 1, 1803. He served for ten years, first in a scrivener's and then in an attorney's office, and in spite of many hardships learned Latin, Spanish, French, Italian, and German. Subsequently he was employed in the library of Trinity College and in the office of the Irish ordnance survey. Weakened by dissipation, he died of cholera, June 20, 1849. Mangan holds the first rank among the Irish song writers of his day. Consult: *Poems* (incomplete), ed. by Mitchel (New York, 1859); and O'Donoghue, *Life and Writings* (London, 1897).

MAN'GANESE (Neo-Lat. *manganesium*, an arbitrary variant of *magnesium*, magnesium). A metallic element first isolated by Gahn in 1774. It is generally accepted that Pliny was acquainted with pyrolusite, or manganese dioxide, and assuming it to be a variety of magnetic iron ore, which was called *lapis magnesius*, he called the manganese compound *magnesia*. Basil Valentine and later chemists regarded the compound as an ore of iron, and mentioned its use in glass-making under the name of *lapis manganensis*. That the compound really contains no iron was first shown by Pott in 1740, and later researches by Scheele and Bergman established the fact of its being a distinct chemical species. The name *magnesium*, at first applied to its isolated metal, was changed to *manganese* by Buttmann in 1808.

Manganese ores are found in many parts of the United States, notably in California, Colorado, Arkansas, Georgia, Michigan, New Jersey, and Virginia, but the deposits have nowhere proved to be sufficiently extensive to supply the domestic requirements. One of the largest mines, situated near Crimora, Augusta County, Va., has been operated for nearly fifty years and is still productive. The ore occurs in pockets in a thick bed of clay, and is mined by the hydraulic process. There are similar occurrences of manganese in Bartow County, Ga., and at other localities along the Appalachian Mountain system. Colorado is an important producer of low-grade manganese ores which carry a large percentage of iron. The total output of the United States in 1901 was 11,995 long tons, valued at $116,722. In addition there was a production of 574,489 long tons of manganiferous iron ore. Enormous deposits of manganese are found in Southern Russia and in the State of Minas Geraes, Brazil. Small quantities of manganese are also present in certain mineral waters, in many plants, especially the cereals and vegetables used as human food, and it is a constituent of the sun's atmosphere. The metal itself is readily obtained by reducing the oxide with carbon, or by heating manganese chloride with metallic sodium. Manganese (symbol Mn; atomic weight, 55) is a very hard, grayish-white metal with a reddish lustre. It takes a high polish and is not malleable. Its specific gravity varies between 6.89 and 7.99. Its melting point is about 1897° C. (about 3447° F.). The metal itself has no uses, but forms valuable alloys with aluminum, copper, iron, and mercury. Those with iron, containing from 8 to 80 per cent. of manganese, are used in the manufacture of steel under the names of *Spiegeleisen* and *ferromanganese*. The presence of manganese in iron and steel is said greatly to increase their elasticity and hardness, and even one per cent. of manganese will render cast steel more tenacious.

With oxygen manganese forms several oxides, including a monoxide (MnO), a sesquioxide (Mn_2O_3), a dioxide (MnO_2), a trioxide (MnO_3), and a heptoxide (Mn_2O_7). Besides these, a number of intermediate oxides are believed to exist. The most important of the oxides is the *dioxide* or peroxide, which occurs native as *pyrolusite* and is the 'black manganese' of commerce, a substance largely used in the manufacture of chlorine (q.v.), and in the preparation of oxygen (q.v.), as well as in the making of black enamel for pottery, and in the manufacture of glass. The *sesquioxide* of manganese, or manganic oxide, occurs in nature as the mineral braunite, or, in a hydrated form ($Mn_2H_2O_4$), as the mineral manganite. The *monoxide* of manganese, or manganous oxide, occurs in nature as the mineral manganosite, or, in a hydrated form (MnH_2O_2), as the mineral pyrochroite. It is the manganese salts corresponding to this oxide that are found, always together with iron salts, in mineral water and in the organisms of animals and plants. For the *trioxide* of manganese, see MANGANIC AND PERMANGANIC ACIDS.

While salts have been obtained corresponding to several of the oxides of manganese, many of those salts are unstable and hardly deserve mention. *Manganous chloride*, $MnCl_2$, is obtained as a by-product in the manufacture of chlorine by the action of hydrochloric acid on manganese dioxide. To isolate the chloride from the solution thus obtained, the latter is evaporated until it contains no more free hydrochloric acid, then part of it (about one-quarter) is precipitated with an excess of sodium carbonate, the precipitate (manganous carbonate) is washed with water and added to the rest of the solution, and the latter is kept boiling for some time. On cooling, the solution is filtered, and the filtrate is allowed to evaporate, hydrated manganese chloride separating out in the crystalline state. When freed from its water of crystallization, manganous chloride forms pink crystals that may be distilled in a current of chlorine. The chloride is used for the production of a brown color in calico printing and is employed, in small quantities, in certain operations of analytical chemistry. *Manganous sulphate*. $MnSO_4$, or rather the hydrated form, $MnSO_4 + 4H_2O$, may be obtained by the action of sulphuric acid on manganese dioxide. It is used in dyeing and is official in the pharmacopœia. For other important compounds of manganese, see MANGANIC AND PERMANGANIC ACIDS.

MANGANIC AND PERMANGANIC ACIDS, H_2MnO_4 and $HMnO_4$, respectively. Two important acid compounds of manganese. The former is unknown in the free state, but is well known in the form of certain of its salts, termed *manganates*. The most important of these are the manganates of potassium (K_2MnO_4) and barium ($BaMnO_4$). Potassium manganate is obtained by fusing manganese dioxide with caustic potash and potassium chlorate; on cooling, the mass is dissolved in a moderate quantity of water, and the solution is allowed to evaporate in vacuo. The salt thus obtained is unstable, being readily decomposed by acids, or even by an excess of water, into potassium permanganate (see further below), caustic potash, and manganese dioxide. It is this reaction that causes the well-known change of color in solutions of potassium manganate. The manganate of barium is obtained by heating barium oxide with manganese dioxide; it may be used as a green pigment. *Manganic anhydride*, or manganese trioxide (MnO_3), may be obtained by dissolving potassium permanganate in strong sulpuric acid and heating the solution.

Permanganic acid may be obtained in the uncombined state by the action of sulphuric acid on barium permanganate; but the resulting solution decomposes with extreme readiness and hence the acid cannot be isolated from it. The solution is deep-red in color and has powerful oxidizing and bleaching properties. The most important among the *permanganates*, or salts of permanganic acid, is the permanganate of potassium ($KMnO_4$), which forms long prismatic crystals having a deep-red color by transmitted light and a green metallic lustre. It may be prepared by heating one of the oxides of manganese with an alkali and potassium chlorate or some other oxidizing agent, and heating the resulting mass with water, when manganese dioxide is precipitated and potassium permanganate remains in solution. A method of preparation often employed consists in adding potassium chlorate to a solution of caustic potash, adding finely powdered mineral manganese dioxide to the solution, evaporating to dryness, heating the residue to a semi-liquid condition, allowing to cool, dissolving the resulting mass in hot water, and passing into the solution a current of carbonic acid gas, until the transformation appears to be complete. The solution is then filtered through guncotton, concentrated by evaporation, and allowed to crystallize. In the solid state, as well as in concentrated solutions, potassium permanganate is very readily decomposed. Mixed with sulphur and phosphorus, solid potassium permanganate can be ignited by striking. Mixed with charcoal, it can be ignited by moderate heating. Its saturated solution (one part in 15 parts of water at ordinary temperature) decomposes on the application of gentle heat and even on standing for some time at ordinary temperatures. Even in dilute solution potassium permanganate acts as a powerful oxidizing agent, and upon this are based many of its uses in medicine, analytical chemistry, and the arts. Sugar and many other organic substances are readily oxidized by it. Potassium iodide (in solution) is converted by it into potassium iodate. If a solution of potassium permanganate is mixed with one of peroxide of hydrogen (another oxidizing agent), the two substances give up part of their oxygen simultaneously, so that both are reduced at the same time. The oxidizing power of potassium permanganate is considerably increased in the presence of acids. Among the uses of the permanganate may be mentioned its use for the preparation of oxygen, its use as a bleaching agent, its use in the purification of water, ammonia, and carbonic acid gas, its use in photography, and finally its use as a disinfectant, deodorant, and antiseptic in medicine. It is employed as a deodorant for bed-pans and as a wash for the hands, the solution commonly used being known as 'Condy's red fluid.' In a very dilute form it may be used as a mouthwash or gargle and as an injection in cases of gonorrhœal and other morbid discharges. According to some authors, if given internally in the form of pills, potassium permanganate has an action much like that of the salts of iron. The *permanganate of sodium* is very similar to that of potassium, and is prepared by an analogous method. In the arts, sodium permanganate is often employed in place of the potassium salt, but the latter alone is employed in chemical analysis. *Permanganic anhydride*, or manganese heptoxide, Mn_2O_7, is extremely unstable.

MAN'GANITE (from *mangan-ese*, from Neo-Lat. *manganesium*, arbitrarily altered from *magnesium*). A hydrated manganese peroxide that has a submetallic lustre, and is dark steel-gray to iron-black in color. It usually occurs in veins associated with calcite and barite in the older rocks. Manganite is found in the Harz, Thuringia, Sweden, Norway, England, and in the United States at various localities in Michigan and Colorado. In common with other manganese minerals it is used in the manufacture of alloys, as spiegeleisen and ferromanganese, and as a coloring material in calico printing and dyeing, for coloring glass and pottery, and in the manufacture of paints.

MANGATARÉN, mȧn-gä'tȧ-rân'. A town of Luzon, Philippines, in the Province of Pangasinán (Map: Philippine Islands, E 4). It is situated on the Agno River Road, 17 miles south of Lingayén. Population, about 10,150.

MANGE (OF. *mangeue*, *mangue*, *manjue*, *menjue*, itch, voracity, food, from Lat. *manducare*, to chew, devour). A disease of horses, dogs, and cattle, similar to scab in sheep, and itch or acariasis in the human subject, resulting from the attacks of minute mites, which burrow in the skin, especially if it be dirty and scurfy, cause much irritation, heat, and itching, and the eruption of minute pimples, with dryness, scurfiness, baldness, and bleaching of the skin. The treatment consists in destroying the mites and insuring the cleanliness and health of the skin, both of which objects are effected by washing the parts thoroughly every second day with soft soap and water, and dressing daily with sulphur or mild mercurial ointments, or with a solution containing four grains either of corrosive sublimate or arsenic to the ounce of water. Castor-oil seeds, bruised and steeped for twelve hours in buttermilk, are very successfully used by the native Indian farriers. Where the heat and itching are great, as is often the case in dogs, a few drops of tincture of belladonna may be added to the usual dressing, or applied with a little glycerin.

Where the general health is indifferent, as in chronic cases, the patient should be liberally fed, kept clean and comfortable, have an occasional alterative dose of any simple saline medicine, such as nitre or common salt, and a course of such tonics as iron or arsenic. Cleanliness and occasional washing and brushing maintain the skin in a healthy state, and thus prevent its becoming a suitable place for the mites. The most suitable and convenient method for treating the so-called psoroptic scabies or mange of cattle is to build large dipping vats and plunge the affected cattle into a dip containing lime and sulphur.

MANGEL-WURZEL, mäŋ'g'l-wûr'z'l (Ger., beet-root), or Field Beet. A general name for the varieties of the common beet (*Beta vulgaris*), now extensively grown in temperate climates, especially in Europe, for the feeding of cattle, sheep, and swine. Formerly only garden varieties of the beet were grown, but during the last century larger, coarser varieties suitable for fodder came into prominence. The different varieties of field beets are generally divided into four groups: first, according to their shape, which is either long or more or less globular; and second, their exterior color, red or yellow. The long red and long yellow varieties produce the heaviest yields, but are usually coarse and fibrous and of low feeding value as compared with other varieties. A number of varieties of this group with twisted roots are known as the oxhorn varieties; the intermediate forms, also known as gate post varieties, have large oval roots with red, yellow, or orange skins. The tankard varieties, which are of uniform width except at the abruptly tapering extremities, are shorter than either the long or the intermediate varieties. The mangel-wurzel is best adapted to deep clayey loam soils, moist but well drained, well tilled, and rich in plant food. In countries where this root has a place in the rotation of crops a heavy dressing of barnyard manure is incorporated in the soil before planting the seed, which is done in early spring. Six or eight pounds of seed are used to the acre in drills about two feet apart, the distance between the plants in a row being about one foot. To insure quick and equal germination, the seed is often steeped in warm water before planting. Close planting gives smaller and relatively more nutritious roots. During the growing season the crop is hoed by means of the cultivator or the hand-hoe to keep the surface loose and free from weeds. Since the roots are injured by frost, the harvesting should be done before freezing occurs, the roots being dug by hand or lifted with an implement designed for the purpose; and if properly harvested without bruising, which induces decay, and well stored in a cool cellar or in pits, they will keep till late in the spring. The yield usually ranges from 18 to 25 tons per acre. Feeding value of mangel-wurzel averages the following percentage composition: water, 90.9; protein, 1.4; fat, 0.2; nitrogen-free extract, 5.5; crude fibre, 0.9; and ash, 1.1. Like most roots, they are very succulent. The food value is chiefly dependent upon the starch and other carbohydrates making up the nitrogen-free extract. Roots of all kinds are much more commonly fed in Europe than in the United States. In Great Britain they replace much of the forage and grain in the ration of stock, as much as 20 pounds being fed daily to sheep, and 100 pounds to cattle. Mangel-wurzel are chiefly used in the United States to give variety to the ration and are fed in smaller quantities. They are most often fed to dairy cows, 20 to 30 pounds being a fair daily allowance. They are sometimes fed to sheep, and boiled and mixed with meal they furnish good feed for pigs. Like other roots, they should be sliced for sheep, and sliced or pulped for cattle. Some feeders believe that they are valuable not because they themselves induce greater gains, but because they stimulate the appetite for other feeds and tend to keep the animal in good physical condition.

MANGEL-WURZEL.

MAN'GIN, Edward (1772-1852). An English writer on literary topics, born in London, July 15, 1772. He went to Balliol College, Oxford, where he graduated B.A. in 1793, and M.A. in 1795. Entering the Irish Church, he held prebendal stalls in Killaloe Cathedral, and in Saint Patrick's, Dublin. Having a comfortable income, he passed most of his time at Bath, where he became known for his pleasing conversation and literary attainments. He died at Bath, October 17, 1852. Among his publications are: *The Deserted City, or Bath in Summer*, a parody on Goldsmith's *Deserted Village* (1805); *An Essay on Light Reading* (1808); *Utopia Found: An Apology for Irish Absentees* (1813); *An Intercepted Epistle from a Person in Bath to His Friend in London* (three editions, 1815); *Piozziana: Recollections of Mrs. Piozzi* (1833); *Vagaries in Verse* (1835); *Miscellaneous Essays* (1851).

MANGLE (Dutch *mangel*; connected with Ger. *Mange*, mangle, Icel. *mangi*, mangonel, from ML. *manganum*, from Gk. *μάγγανον*, *manganon*, instrument for throwing stones). A machine for smoothing linen and cotton goods, such as tablecloths, sheets, etc., after washing, by passing between rollers. See Laundry Machinery.

MANGO, mäŋ'gō (from Malay *mañggā*, Tamil *mānk*, mango-fruit), *Mangifera*. A genus of about 25 species of evergreen trees of the natural order Anacardiaceæ, natives of India and the Malay Peninsula. The common mango (*Mangifera indica*) is a spreading tree of rapid growth, which attains a height of 40 feet or more, but whose undivided trunk is rarely more than 10 feet long. The foliage is very dense, forming a welcome shade. Its leaves are entire, lanceolate, shining, six to eight inches long. The flowers are rather small, reddish white or yellow, borne in dense panicles. The fruit is more or less kidney-shaped, smooth, varying in size and color with different varieties, and contains a large flattened stone nearly as long as the fruit. The shell of the seed is rough and fibrous; in some of the poorer varieties the fibres are very abundant and apparently make up a considerable portion of the fruit. In the choicer kinds the pulp is more solid and rather free of fibres. This tree exists in nature in India, where it extends up the Himalayas to elevations of 3500 feet or more. It has been extensively introduced into other regions, so that now it is cultivated in nearly all tropical and subtropical countries. In India there are said to be more than 150 cultivated varieties, the fruit of some weighing a pound or more. All parts of the tree have a turpentine fragrance, and in some varieties the flavor of turpentine in the fruit is very pronounced. Others are without it and are highly prized for desserts, being luscious, sweet, or with a slight acidity. The unripe fruits are used for pickles, sauces, etc., and the kernels are often roasted and eaten. They are nutritious and in times of scarcity are used as food by the poorer classes of India. The mango was introduced into Jamaica in 1782, and much attention is given its cultivation in that country. Its cultivation has been extended throughout the West Indies and to some extent in southern Florida and California. Eight-year-old trees in Florida have borne as many as 5000 fruits in a season. The trees are propagated either from seed or by inarching of choice varieties upon vigorous seedling stock. Of the other species *Mangifera fœtida*, called the horse mango, is a large tree native of Malacca and vicinity. The fruit, which has a peculiar characteristic odor and flavor, is highly esteemed by the natives, and is cultivated throughout India. *Mangifera oppositifolia*, by some botanists called *Boula burmanica*, is a wide-spreading lofty tree which grows wild in Burma. It bears an edible yellow fruit about the size of a large plum. There are numerous varieties, some of which are sweet, others sour. *Mangifera sylvatica* also bears an edible fruit esteemed by the natives in India. It is often dried and kept for medicinal purposes. The wood of the different species is gray, rather soft, and used for building purposes. Canoes and boats are made of the timber of the common mango, and when well seasoned it makes good packing cases.

MANGO (*Mangifera indica*).

MANGO-BIRD. A bird frequenting mango trees: (1) in Jamaica, a humming-bird (*Lampornis mango*); (2) in India, an oriole (*Oriolus kundoo*).

MANGO-FISH (so called because it makes its appearance in April, about the same time as the mangos). A small perch-like fish (*Polynemus plebijus*) which abounds along the shores of Southeastern Asia, and in India enters bays and river-mouths at the season when the mango-fruits grow ripe. It represents a distinct but small group of tropical fishes (Rhegnopteri), of which several species are known under the family name 'threadfins,' or Polynemidæ. The most prominent among many distinguishing characters of the group is the fact that the actinosts of the pectoral fins are of three forms, two of them normal, supporting the pectoral fin; one longitudinal, without rays; and the fourth a plate on the coracoid supporting free and separate rays, three to ten in number, according to the species. These free rays are filaments trailing from the throat, sometimes longer than the body, each under muscular control; and they serve as feelers, for these fishes not only creep about in muddy estuaries, but are nearly blind, owing to the normal growth of films over the eyes. Several species occur in tropical American waters. One (*Polydactylus Virginicus*), the 'barbu' or 'barbudo' (q.v.) of West Indian fishermen, is an important food-fish in Cuba, and was called 'mango-fish' in the old books. Consult: Gunther, *Introduction to the Study of Fishes* (Edinburgh, 1880); Kirsch, *Annals of the New York Academy of Sciences*, vol. v. (New York, 1890).

MANGO GINGER. A tropical plant. See CURCUMA.

MANGOLDT, män′gōlt, HANS KARL EMIL VON (1824-68). A German economist, born in Dresden. He studied law and political science at Leipzig, Geneva, and Tübingen, and in 1848 was appointed to prepare a history of the industries of Saxony, but was prevented by changes in the administration from carrying out the work. In 1852 he became editor of the Weimar *Gazette*, and in 1855 he published his *Lehre vom Unternehmergewinn*, in which he was the first to analyze fully the phenomena of business profits. In 1858 he became extraordinary professor of political economy at Göttingen, and in 1862 was called to the chair of political and cameral science at the University of Freiburg. In 1863 he published his *Grundriss der Volkswirthschaftslehre*, a treatise of admirable clearness which ranks among the first contributions to the theory of German economics.

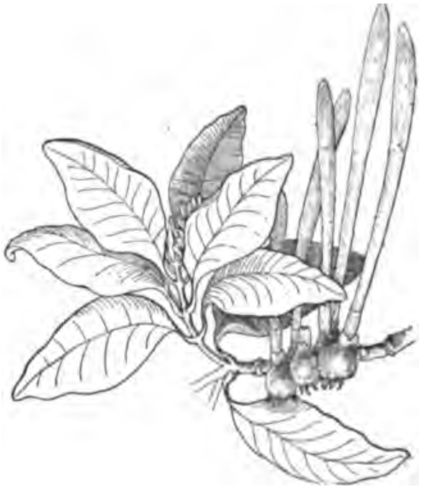
MANGON, or **MANGONEL**. A mediæval implement of warfare, similar to the ballista, used for throwing stones and other missiles. See ARTILLERY.

MANGONI, mân-gō′nē, or **ANGONI.** Zulu intruders into the Nyassa region, British South Central Africa. They number about 230,000 and are descendants of a Zulu tribe which migrated from Zululand and crossed the Zambezi about 1825, founding a kingdom southeast of Lake Tanganyika. Thence they migrated west of Lake Nyassa, where they established three separate kingdoms. These military migrations are characteristic of the Zulus, who have been the cause of far-reaching ethnic displacements in Africa. In their movements they eliminated the men, and by marriages with the women of the conquered tribes, themselves became greatly modified, especially in language. The aristocracy of the Mangoni perpetuate the Zulu customs, while their language is that of their mothers. Thus they wear the apron of cat-tails, and when engaged in war, kilts of skins around the waist or over the left shoulder and a headdress of raven and cock feathers, and carry clubs and stabbing assagais, the shafts of the latter being ornamented with goatskin. The oval shield of antelope or cowskin, like that of the Zulu and Matabeles, is also carried. They wear a profusion of personal ornaments, strips of hide with long hair secured around the leg and upper arm, armlets of elephant toe-nails and ivory, and charms in shells, antelope-horns, or beaded leather cases. The Zulu head ring of plaited hair and wax is sometimes seen and the ears are bored to hold blocks of polished wood or ivory. The Mangoni are fine specimens of men and carry themselves well. The chief owns the herds of cattle, while the flocks of sheep and goats belong to individuals. Their villages are large and are composed of circular wattle and daub houses surrounded by compounds fenced in with reeds. Their vegetable food consists of maize, sorghum, cassava, rice, millet, sweet potatoes, beans, and peas. Cotton, oil seeds, and tobacco are also raised. The rule of the chief is supreme, but there is a numerous body of *idunas* or councilors, whose advice is sought. These councilors are assigned to various districts, for which they are responsible to the chief. The clan system prevails. The religion of the Mangoni is the worship of ancestors, and in the cult ceremonies and offerings are made to appease them. Several grades of witch doctors are possessed of priestly authority; the chief is high priest by virtue of his office. The best account of the Mangoni is given by Robert Codington in the *Geographical Journal* (London, 1898).

MANGOON, MANGUN. See OLCHAS.

MAN′GOSTEEN (Fr. *mangostan* [the tree], *mangonste* [the fruit], from Malay *mangonsta*, *mangis*, the native name), *Garcinia Mangostana.* One of the most delicious of all fruits, produced by a tree of the natural order Guttiferæ, a native of the Molucca Islands. The tree, which rarely exceeds 20 feet in height, has an erect tapering stem, and a regular form, somewhat like that of a fir. The leaves are 7 or 8 inches long, oval, entire, leathery, and shining; the flowers large with corolla of four deep red petals. The fruit, which is orange-like, dark reddish-brown, spotted with yellow or gray, has a thick rind, and is divided internally by thin partitions into segments like the orange. The pulp is soft and juicy, cooling, with a mixture of sweetness and acidity, and delicately flavored. The mangosteen is cultivated in Java and in the southeast of Asia, and has been successfully introduced into some other tropical countries.

MANGROVE (from Malay *mañggi-mañggi*, mangrove; influenced by popular etymology with *mangs*, and *grove*, in allusion to its spreading by the formation of new stems), *Rhizophora.* A genus of plants of the natural order Rhizophoraceæ, which consists of trees and shrubs, all tropical and natives of coasts, particularly about the mouths of rivers, where they grow in the mud, and form a close thicket down to and within the sea, even to low-water mark. The coast and keys of southern Florida abound in mangroves. Most of the species send down roots from their branches, and thus rapidly extend over large spaces. The club-like seeds have the peculiarity of germinating while still attached to the parent branch, a long thick radicle proceeding from the seed, and extending rapidly downward till the fruit falls off, and is quickly imbedded in the mud. Only three or four species are known. They are of little use except for fuel and tanning; the wood of some is hard and durable. The fruit of the common mangrove (*Rhizophora Mangle*) is sweet and eatable, and its juice, when fermented, yields a light wine. The bark is used in tanning. See Plate of MAGNOLIA AND MANGROVE.


MANGROVE (*Rhizophora Mangle*).

MANGROVE-HEN. In Jamaica, the long-billed rail (*Rallus longirostris*), of which the North American clapper rails are varieties. See RAIL.

MANGROVE SNAPPER. A fish, the gray snapper (q.v.), so called in Florida and the Bahamas because the young abound in the protection of the mangrove trees which everywhere border the seacoast.

MANGROVE SWAMP. A plant formation common on seacoasts and tidal river shores in tropical and subtropical climates. The dominant vegetation consists of mangrove trees interspersed with plants of similar habit. The accumulation of débris and mud among the roots and trunks builds up the land so that bays are filled and river banks extended until the streams are restricted to narrow channels between dense walls of trees which completely conceal the shores.

MANGUANGA, mȧn-gwän′gȧ. A name used for wild Malay tribes in the forests of Mindanao. See Philippine Islands.

MANGUIÁN, mȧn′gē-än′, or **MANGYÁN**. A wild Malay-Negrito-Mongoloid people, comprising many tribes on Mindoro, Romblón, and Tablas islands; the separate tribes have many names, such as Bakil or Buquil, etc. Also a little-known tribe on Sibuyán Island. See Philippine Islands.

MANGU KHAN, män′gōō kän. See Mongol Dynasties.

MAN′GUM, Willie Person (1792-1861). An American politician, born in Orauge County, N. C. He was graduated from the University of North Carolina in 1815, and was admitted to the bar in the following year. In 1818-19 he served in the General Assembly, and was elected by that body judge of the Supreme Court in 1819, but resigned the next year. He served as a member of the United States House of Representatives from 1823 to 1826, when he again became judge. He was a Presidential elector in 1829, and in 1831 became a member of the United States Senate. At the request of the Legislature he resigned in 1836, and the next year he received the eleven electoral votes of South Carolina for President. In 1840 he was returned to the United States Senate in place of Bedford Brown, who had also been requested by the Legislature to resign, and served until 1853, when the Whig Party was practically disintegrated in his State. In 1842 he was elected president of the Senate to succeed Samuel L. Southard, of New Jersey, and served until 1845. During his Senatorial service he was one of the leaders of the Whig Party.

MANHAT′TAN. A city and the county-seat of Riley County, Kan., 52 miles west of Topeka, on the Kansas River, at the mouth of the Big Blue, and on the Union Pacific and the Chicago, Rock Island and Pacific railroads (Map: Kansas, F 2). The State Agricultural College, opened in 1863, is situated here. Manhattan is the commercial centre for a farming and stock-raising district, and has white limestone quarries, cement works, a foundry, and agricultural machine works. The waterworks are owned and operated by the municipality. Population, in 1890, 3004; in 1900, 3438.

MANHATTAN COLLEGE. A Roman Catholic institution in New York City, under the control of the Brothers of the Christian Schools. It was opened in 1849 as an academy for young men under the name of the Academy of the Holy Name, and was incorporated under its present name in 1863. It has an arts and a science department, conferring the degrees of B.A. and B.S. Besides the college proper there are an academic, a commercial, and a preparatory department. A course in civil engineering, leading to the C.E. degree, is also offered. In 1903 the registration was 561 and the faculty numbered 38. The college library contained 12,000 volumes. The income was $46,940.

MANHATTAN ISLAND. An island at the head of New York Bay, forming the borough of Manhattan in New York City, and containing the commercial and financial nucleus of the metropolis, together with its main residence portion. It is situated between the Hudson or North River and the East River; Spuyten Duyvil Creek and the Harlem River separate it from the mainland on the north and northeast. The island, with tapering northern and southern extremities, a few hundred yards wide, is 13½ miles long, with a maximum width, at Fourteenth Street, of 2¼ miles, and an area of 22 square miles. It has a wharfage front of 22 miles, with a depth of water sufficient for the largest vessels. The Brooklyn Bridge connects Manhattan Island, about a mile from its southern extremity, with Long Island; another bridge about a mile to the east of this is nearing completion; three miles farther north a bridge will span the river where the channel is divided by Blackwell's Island. A number of bridges span the Harlem River and Spuyten Duyvil Creek, and numerous steam ferries communicate with the adjacent shores. The surface is undulating and rocky, in the north rising from the Hudson to an altitude of 238 feet at Washington Heights, but sloping abruptly toward the east, where is a level stretch formerly known as the Harlem Flats. Farther south the elevation continues as a central ridge, with a gentle slope on either side. Extensive leveling was necessary in laying out the streets. With the exception of the Harlem plain and an extensive bed of beach sand to the south and east of City Hall, the island is chiefly composed of crystalline Archæan rocks with intercalated veins of gneiss, mica schist, and hornblende, overlaid by generally shallow glacial drift deposits. The greater part of the city is built on the rock foundation; pile foundations, however, are resorted to in the deeper glacial deposits and in the beach sand. Peter Minuit, the first Dutch Governor-General, is said to have received Manhattan Island in 1626 for barter to the value of about $25; the ground value alone is now estimated at over $2,500,000,000.

MANI, mä′nē, also called Manes and Manichæus (c.216-277). A Persian sage, founder of a religious and philosophical system, which spread widely and lived long, especially in its western forms. The most valuable accounts of Mani's life are found in Mohammedan histories. He was born near Ctesiphon, in Mesopotamia, where he received his education. His father, Fatak, was connected with the Mughtasilah, a South Babylonian sect of 'baptizers,' akin to the Mandæans (q.v.) and perhaps also to the Elkesaites (q.v.). Toward his thirtieth year Mani began the new religious movement which was to bear his name, preaching at the Court of the Persian King, Shapur I. He claimed that he received divine revelations, and that he was the final prophet of God to the world. Not meeting with great success at Court, he undertook a series of missionary journeys, penetrating into Turkestan, India, and China. He also sent out disciples to preach his doctrines. After spending many years in missionary labor, Mani returned to Persia, where he now won converts even at the royal Court. But the Magians (the Persian priesthood) rose in opposition, and he was imprisoned, but managed to escape. After the death of Shapur, Mani returned to the capital and was received with favor by the new King, Hormuz I. But the Magians renewed their attacks, and after some years of conflict secured his condemnation, during the reign of Bahram I. Mani was crucified, and his body was flayed and exposed to public contempt. His followers suffered bitter persecution.

Mani is reported to have been a man of great and varied ability along several lines, e.g. in the art of painting. He was not content with writing in the Syriac and Persian languages, but invented an alphabet of his own. His works, which were known to the Mohammedan historians, but have since been lost, included the *Book of Secrets*, describing certain Christian sects of the East; the *Book of Precepts for Hearers*, the most widely current of his writings, probably to be identified with what Augustine calls the *Epistola Fundamenti;* and a *Holy Gospel* (perhaps not its actual title, though it is so called), a work written in Persian while Mani was in retirement in Turkestan. He also wrote several shorter treatises and numerous letters.

Among the most important sources for Mani's life are the Arabic *Fihrist* by Abulfarag an-Nadim (tenth century), edited by Flügel (Leipzig, 1871-72); the Greek *Acta Disputationis Archelai*, edited by Routh, in *Reliquiæ Sacræ*, vol. v. (Oxford, 1848), translated into English in the *Ante-Nicene Fathers*, American ed., vol. vi.; and Eusebius, *Ecclesiastical History*, vii. 31. In Latin, the works of Augustine are valuable for western Manichæism; consult the *Nicene and Post-Nicene Fathers*, first series, vol. iv. (edited by P. Schaff). In general, consult: De Beausobre, *Histoire critique du Manichéisme* (Amsterdam, 1734); Kessler, *Mani*, bd. i., *Voruntersuchungen und Quellen* (Berlin, 1889); Harnack, *History of Dogma*, vol. iii. (London, 1897). For Mani's doctrine, see Manichæism.

MANIA (Lat., madness). A form of insanity characterized by exaltation of emotional state and hyper-excitation of cerebral and nerve function. The manner of one suffering from mania is indicative of active fancy, acute perception, extravagant ideation, rapidity of thought, and great exaggeration in action. There is a loss of natural self-control. Generally pleasurable and expansive ideas fill the mind. The patient imagines he is wealthy, prominent, possessed of unlimited strength, and he desires to make others happy by sharing his fancied possessions. Excesses in eating, drinking, and sexual indulgence are frequent, in persons hitherto abstemious and moral. The maniac's condition resembles mild intoxication, and he is easily angered by reproof or contradiction, or by imaginary affront or mere interruption. The pleasurable state then gives way to violent anger. The regnant note in mania is egotism. Violence is frequent. Hallucinations, delusions, and illusions are common. See Insanity.

The outset of an attack of mania is rarely sudden. Generally a period of depression precedes, with digestive disturbance, pressure and pain in the head, insomnia, lack of power of attention, and physical and mental exhaustion. This period lasts from one to three months. The disappearance of depression and its replacement by exaltation is often mistaken for a return to health, till violence appears, and exaggerated ideas are found to have a delusional basis. Simple mania persists for about three months in acute cases, or for a year in milder cases. If a case continues for over a year, the chances of recovery are lessened. From 10 to 15 per cent. of all insane are maniacs. Unfortunately, the popular idea of a crazy person is that of a maniac, and many people hesitate to accept the truth of the existence of insanity in a patient of quiet demeanor. Mania appears generally between the ages of twenty-five and thirty-five years, the period of initial stress and strain in the average life, and the period during which alcoholic and venereal excesses are more frequent. From 60 to 80 per cent. of the cases of mania recover, under proper custodial care. Institutional life, with its routine and its atmosphere of order and obedience, is very salutary for most cases, in addition to providing safety for both patient and relatives. Patients who do not recover pass into chronic mania and later into terminal dementia. About 4 per cent. of the cases of simple and acute mania are of the exhaustive type, and die of the mania or from a complicating pneumonia or from some such disorder, especially in alcoholic cases. As progress is made toward recovery in favorable cases, an occasional lucid interval occurs, with relapses into violence and exaltation, until convalescence is established.

In patients who are handicapped with a hereditary predisposition to insanity, attacks of mania are frequent upon subjection to the injurious influences that produced the first attack. Such a condition has been called 'recurrent mania.'

The toxic neuroses due to abuse of alcohol, chloral opium, the bromides, etc., are manias. With the exception of alcoholic insanity, they are rarely seen. The insanities occurring in some cases of hysteria and epilepsy are also manias. See Epilepsy and Hysteria.

Mania occurs in circular insanity (*cyclothymia*), alternating with melancholia and a lucid interval. The treatment of mania is largely dietetic and hygienic. In most cases of insanity more management is needed than medicine. To meet special indications the physician uses sedatives and hypnotics, tissue-builders, intestinal antiseptics, and stimulants of circulatory and lymphatic apparatus.

For the legal aspects of mania, see Insanity and Lunacy.

MANICALAND, mȧ-nĕ'kȧ-lănd. Formerly a tributary State of Gazaland, and now divided between Portuguese East Africa (q.v.) and Rhodesia, forming in the latter part of the Province of Mashonaland (q.v.). It is very valuable for its gold fields and is traversed by the railway line from Beira to Fort Salisbury.

MAN'ICHÆISM. A speculative religious system of Western Asia, founded by Mani (q.v.) in the third century of our era. The ideas upon which it was based probably originated in Babylonia, but it assimilated others of Persian (Zoroastrian) and Christian origin, and perhaps some from Buddhism, although this has been questioned by recent critics. The Christianity from which it borrowed was of the Gnostic type (see Gnosticism), and Manichæism has been called, not improperly, 'the most complete Gnosis.' Its western branch came closely in contact with the Church, and appropriated so many Christian ideas and usages that it was sometimes regarded as a heresy, although it was properly a rival system. It differed from Christianity, among other things, in its complete rejection of the Old Testament.

The dualism which Mani taught was radical and materialistic, postulating two opposite original domains, represented respectively by light and darkness, good and evil. They are from eternity contiguous, yet distinct and separate. The kingdom of light included both a heaven and an earth, the latter guarded by good angels (æons). This kingdom has its Good Spirit, or God, whose attributes are set forth in a series of ten (some say twelve) virtues. It is not certain that Mani assumed a second god for his kingdom of darkness, but this kingdom was at least personified, and from it sprang Satan and the evil demons. There is an earth of darkness, analogous to the earth of light, and its five qualities—all obviously evil—are mist, heat, the sirocco, darkness, and vapor. What might be called the equilibrium of the two kingdoms was destroyed by Satan, who overstepped his own boundaries and invaded the light realm. To oppose him God created 'primal man,' who should be the champion of the invaded kingdom and fight its battles against the evil demons. All this is the prelude to human history.

Mankind came into existence after a long cosmic process, everywhere attended by disturbance and disaster. Light and dark elements had already become entangled with one another and the conflict had begun before the creation of our present world, but with the advent of humanity it began to wax keener and more tragic. All men are compounds of light and darkness in varying proportion, and these wage their conflict in each individual. The destiny of the race is to have its light portions finally liberated, which result will accompany the restoration of the lost cosmic order in the universe. Some of the accounts represent the signs of the Zodiac as playing an important part in gathering together the scattered particles of light. We also hear of a great final catastrophe, which shall bring the whole process to an abrupt conclusion. The influence of a docetic Christianity appears in Western Manichæism in the notion of the 'Jesus patibilis' and 'impatibilis.' The former term was applied to the light which had become diffused throughout the world. By a peculiar application of the proper name Jesus, the sum total of these particles came to be regarded as a being capable of suffering, and actually enduring it, through contact with evil matter. The other term, 'Jesus impatibilis,' means a sort of phantom, attendant upon the historic Jesus, but not partaker of his human experiences or sufferings. He was rather a messenger descended from the realm of light to aid in the world's redemption. In this work other prophets had taken part, and to crown the series Mani himself appeared, the final prophet of human history.

The Manichæans fall into two classes, the *perfecti*, or fully initiated members of the society, and the *auditores*, hearers or novitiates. The 'hearers' constituted by far the larger body, and held the 'perfect' in the highest veneration. Saint Augustine, before his conversion to Christianity, was for nine years a Manichæan 'hearer.' The elect followed the ascetic rule of life, being distinguished by their threefold 'seal' of mouth, hands, and bosom. The *signaculum oris* required abstinence from all defilement through evil speech or animal food; the *signaculum manuum*, abstinence from all avoidable contact with the material world; and the *signaculum sinus*, abstinence from marriage and from all sexual indulgence. The uninitiated were satisfied with a less exacting moral standard, and lived very much as other men and women do.

The Manichæans were organized under a sort of hierarchy, in some respects like that of the Catholic Church. Augustine tells us of a graded system of officers, including 12 'teachers,' 72 'bishops,' and a number of 'elders.' Above them all stood one supreme authority, for a long time resident in Babylon, but afterwards in Samarkand, who was apparently regarded as the representative of Mani. The worship of the Manichæans was not elaborate. It included, besides the ordinary service of prayer and song, an initiatory rite of baptism, in which oil was used instead of water, and a eucharistic meal. Fasting was emphasized as very important for the elect. An annual festival, called the *Bema*, commemorated the death of the founder, Mani.

From the latter part of the third century Manichæism spread rapidly within the Roman Empire. Among its early adherents were survivors of the Gnostic sects, especially the Marcionites. (See MARCION.) It also won converts from the non-Christian educated classes of Europe, and in Africa even clergy embraced its teachings. By the end of the fourth century it had become one of the three great world-systems, competing with Neo-Platonism and Christianity for religious and intellectual leadership. The most notable of its early Christian opponents were Titus of Bostra, Metropolitan Bishop of Arabia, and Saint Augustine. The Roman Government took measures against the Manichæans almost from the beginning. Diocletian issued an edict against them, commonly dated about 287. Valens (364-378) issued other similar decrees. Manichæans were condemned to exile under Valentinian III. (425-455), and to death under Justinian (527-565). But nothing seemed capable of crushing the movement. It survived even the attacks of Islam, and flourished in Asia beyond the tenth century, whence it made its way once more into Europe in the heresies known under the names of the Paulicians, Bogomiles, Cathari, and Albigenses (qq.v.). For references to the literature, see MANI.

MANIÈRE CRIBLÉE, mȧ'nyâr' krē'blā' (Fr., sieve-fashion). Probably the oldest process of engraving upon metal for the purpose of printing. It derives its name from the white dots with which the dark ground of the print is covered, resembling the holes of a sieve. These dots, which form the outlines of the engraving, were beaten into the plate by means of a punch, the parts hollowed out forming a light image on a dark ground. The plates were made of some soft metal, like brass. The earliest examples of prints, of the Bibliothèque Nationale (Paris), are from Cologne, where the art may have originated, in a manuscript dating at latest from 1406. The manière criblée continued to be practiced as late as the first quarter of the sixteenth century, but was never an important factor in the development of engraving.

MANIFEST (Lat. *manifestus*, evident), COMMERCIAL. A document, in commercial navigation, delivered to the officer of customs, by the captain of a ship, which gives a list in detail of the cargo in his charge, with the names of the places where the goods were shipped, and to which they are addressed.

MANIFESTO (It., manifest). In international law, the declaration or formal statement which it was formerly customary for a belligerent to publish within its own territory or communicate to other States through diplomatic agents. With modern conditions of intercommunication, whereby events become a matter of common knowledge among the Powers, such a formal notification has become less imperative, although commercial interests and international courtesy usually render it almost obligatory in case of protracted hostilities. See DECLARATION OF WAR.

MANIGLIER, mȧ'nē'lyā', HENRI CHARLES (1826—). A French sculptor, born in Paris. He was a pupil of Dumont and Ramey at the Ecole des Beaux-Arts, and won the Prix de Rome in 1856. He executed a bas-relief for the Paris Opera House, many busts, and the statue, "Pénélope portant à ses prétendants l'arc d'Ulysse" (1868), in the Luxembourg. In 1858 he was made professor of sculpture at the Ecole des Beaux-Arts. He received the cross of the Legion of Honor in 1878, and a bronze medal at the Exposition of 1889.

MANIHIKI (mä'nē-ē'kē) **ISLANDS.** A group of small coral islands or atolls scattered over Central Polynesia between latitudes 4° and 12° S., and longitudes 150° and 166° W., northeast of the Samoan Islands. They aggregate in area about 53 square miles, with a population of over 1800. The entire group now belongs to Great Britain, and is, together with the Cook Islands, under the administration of New Zealand.

MAN'IHOT. A genus of about 80 species of tall herbs and shrubs of the natural order Euphorbiaceæ, natives of tropical and subtropical South America. The best-known species are cultivated in warm climates for their underground parts, which yield a starch known in commerce as Brazilian arrowroot, and cassava (qq.v.).

MANIL'A, *Sp. pron.* mȧ-nē'lȧ. The capital of the Philippine Islands. It is situated on the western coast of the island of Luzon, at the eastern end of Manila Bay, at the entrance of the River Pasig, in latitude 14° 35′ N., and longitude 120° 58′ E. (Map: Luzon, E 8). The city occupies part of an extensive plain on both banks of the Pasig, and surrounded on the land side by a semicircle of picturesque mountains. It is divided by the Pasig into two parts, the old walled city and the suburbs. The former lies on the southern bank of the river, and is surrounded by an old wall with bastions and parapets. The wall is two and one-half miles long, and is pierced by six gateways with drawbridges. It is surrounded by Manila Bay on the west and the Pasig on the north, while on the east and south there are deep moats which are connected by strong gates with the sea, and can be flooded in case of war. The walled city contains the principal public buildings such as the Government offices, colleges, the weather observatory, the Archbishop's palace, and the cathedral. The aspect of the old city, with its gloomy buildings and half crumbled walls, is sombre, imposing, and essentially mediæval. Separated from the old city by the Pasig is Binondo, the centre of the commercial as well as of the industrial activity of the metropolis. Here are situated the principal warehouses, cigar and tobacco factories, the business houses of the European trading companies, and the principal shops. North of Binondo lies the suburb of Tondo, where the working population of the capital lives, chiefly in huts built of cane and palm leaves. San Miguel, situated on an island formed by an arm of the Pasig, is the fashionable suburb of Manila, and contains the fine residences of the wealthy merchants and officials.

Several bridges cross the Pasig from the suburbs, the principal being the Bridge of Spain, a handsome stone structure with a number of arches, leading from Binondo. At the south end of this bridge, and stretching along the Pasig outside the city walls, is the Paseo or Plaza de Magallanes, containing an obelisk erected to the memory of the discoverer of the islands. From this plaza a handsome paseo stretches in a semicircle outside the moat and terminates on the bay front south of the city, where there is a park and promenade called the Luneta, which is lighted by electricity. Most of the streets of Manila are broad and cross at right angles, but the street railroads are of an antiquated type, though modern trolley lines are now being projected, and other modern facilities are being extended. Among the buildings of Manila the most prominent are the former palace of the Captains-General and the cathedral. Both were destroyed by the earthquakes of 1863; the palace is in ruins, but the cathedral has been rebuilt. The custom-house is a handsome building also rebuilt since 1863. The best buildings are, as a rule, the convents and some of the churches. Manila is the intellectual centre of the entire archipelago, and has besides the University of Saint Thomas (see MANILA, UNIVERSITY OF), the College of San Juan de Letrân, a normal school, an athenæum, and an observatory. Manila has several good hospitals, among which are a large military hospital, a home for convalescents, an insane asylum, and the excellent and spacious hospital of San Juan de Dios.

The chief manufactures are cigars and cigarettes, products of the famous Manila hemp or abaca, and some textiles. Iron foundries, machine shops, and various milling establishments are also flourishing. Manila's future, however, will depend chiefly on its commerce. Its harbor, even in its present unimproved state, is very spacious. The city has steamship communication with many of the great ports on both sides of and in the Pacific Ocean. The larger commercial houses are conducted chiefly by Spaniards or other Europeans, while the small trade is mostly in the hands of the Chinese, who are very prominent in the commercial activity of the city. Manila exports mainly sugar, hemp, tobacco and cigars, coffee, dye-woods, and precious metals. The imports are rice, cotton goods, chemicals, metal goods, and wine. The trade is chiefly with China, the United States, and Great Britain, and the carrying is done mostly in British bottoms. Manila is the terminal of the only railway line of the archipelago; it runs to Dagupán, a distance of about 120 miles. The population of Manila and the suburbs, as determined by the census of 1901 revised by the statistics of the Board of Health up to January, 1902, was 293,814 (not reckoning over 3000 members of the United States Army), including 218,900 natives, chiefly Tagálogs, 60,680 Chinese, 7852 foreigners, largely Spaniards, and 6462 Americans. The city received its new charter of incorporation from the Philippine Commission on July 31, 1901, by which the government is vested in a municipal board of three members appointed by the civil Governor.

Manila existed as a palisaded native town under the name of 'Mainila' when it was first visited by the Spaniards. In 1569 Juan de Salcedo, a nephew of Legazpi, the conqueror of the Philippines, made an unsuccessful attempt to found a Spanish colony in the town. In 1571 Legazpi himself appeared in the harbor with a Spanish fleet, and was admitted into the town by the two native chiefs, who rendered homage to Spain. Legazpi at once strengthened the fortifications, and built a church and a number of houses for the Spaniards, and in the same year a municipal government was inaugurated with great solemnity. The city in 1574 was sacked and burned by Chinese pirates; in 1590 the present permanent fortifications were begun. In 1602 an insurrection of the Chinese residents of the city was put down with great severity, several thousands of the insurgents being killed. The same year the city was blockaded by the Dutch. In 1762 it was captured and sacked by the English, who occupied it until 1764.

Toward the end of the nineteenth century Manila became the centre of secret agitation for the overthrow of Spanish sovereignty. Many arrests were made; on September 2, 1896, thirteen prominent Filipino citizens were shot at Cavité; and on December 30th Dr. Rizal was executed at Manila. On August 30, 1897, a skirmish with the insurgents took place on the outskirts of the city, which was then declared under martial law. On May 1, 1898, Dewey destroyed the Spanish fleet in Manila Bay—an event which was the signal for a great uprising of the Filipinos against Spanish rule, under the lead of Aguinaldo, and on August 13th the city capitulated to the American forces. It was placed under a military government and policed by a provost guard of American soldiers. During the winter of 1898-99 the city was practically in a state of siege by Aguinaldo's forces until the actual outbreak of hostilities, which began with an unsuccessful attack of the Filipinos upon the Americans at Manila, on February 4-5, 1899. The actual transfer of the military government to the new civil authorities took place on August 7, 1901.

Manila has a number of times suffered from earthquakes, the most terrible of which occurred on June 3, 1863, when all the prominent buildings were destroyed and several thousand persons killed. Consult the authorities referred to under PHILIPPINE ISLANDS.

MANILA, UNIVERSITY OF. A Philippine university which owes its origin to Philip II. of Spain, who gave permission for the foundation of a university in 1585. In 1601 a seminary for nobles was opened here, and in 1611 the Dominicans established the College of Saint Thomas for natives and poor Spaniards. In 1857 the present university was founded on this school as a basis. It had in 1901 some 1100 students, chiefly in law and medicine. Its faculties comprise also theology, philosophy, science, and pharmacy.

MANILA BAY. A large and beautiful inlet of the China Sea, running into the central part of Luzon on the western coast (Map: Luzon, E 8). It has, roughly, the shape of a triangle with its base line, 37 miles long, forming the head of the bay from southeast to northwest, while its apex is at the entrance, which is 11 miles wide. The depth of the bay from the entrance to the base is 25 miles. The land on both sides of the entrance and along the western shore is high and forested; that on the east and north is low, and the northern shore especially consists of the marshy delta of the Rio Grande de la Pampanga, which enters the bay through numerous mouths, between which tall reeds grow far out into the shallow water. The greater part of the bay, however, has deep water, with good and ample roadsteads at Manila and Cavité, and for harbor purposes it is the finest in the Far East. The entrance is well lighted by a large new lighthouse on Corregidor Island, and another on the smaller island of Caballo. The bay connects through the Pasig River at Manila with the large Bay Lagoon (q.v.) in the interior of Luzon. Manila Bay was the scene of the victory of Admiral Dewey over the Spanish fleet on May 1, 1898. See SPANISH-AMERICAN WAR.

MANILA FIBRE, or MANILA HEMP. See HEMP, MANILA.

MANILIAN LAW. A law proposed at Rome in B.C. 66 by the tribune Gaius Manilius, providing for the recall of the commanders then in Asia, where the Romans were fighting Mithridates, and for the extension of Pompey's power over all the East. Cicero made his first address to the people in support of the proposition of Manilius. The speech, *Pro Lege Manilia*, or *De Imperio Cn. Pompeii*, is in form superior to the orations against Catiline.

MANIL′IUS, MARCUS. The supposed name of the author of a Latin poem on astrology entitled *Astronomica*. Nothing is known of his personality, but he is assumed to have lived in the reigns of Augustus and Tiberius. Five books of his poem are preserved, treating of the constellations and their influence on human life. The work is of no great poetic value, but exhibits diligence and great research. There are no recent editions, but several old ones, including those of Scaliger (Leyden, 1579 and 1600), Bentley (London, 1739), and Jacob (Berlin, 1846), and an English translation by Creech (London, 1697). Consult Ellis, *Noctes Manilianæ* (Oxford, 1801).

MANIN, mȧ-nēn′, DANIELE (1804-57). An Italian patriot. He was born in Venice, May 13, 1804, studied at the University of Padua, and was admitted to the doctorate of laws at the age of nineteen, and after that practiced at the bar, of which his father, Pietro Manin, was an eminent member. After 1831 he became a recognized leader of liberal opinion in Venice. In 1847 his reputation as a political economist was established during the sittings of the scientific congress at Venice. Shortly after he was thrown into prison for a spirited public address against Austrian domination. Previous to the rising against Austria of 1848 Manin was for a second time imprisoned, but when the news came of the revolution in Sicily and of the February revolution in France, he was released in triumph by the populace, was placed at the head of the patriotic movement, and was invested with supreme power as President of the restored Republic of Saint Mark. The organization of a civic guard and the expulsion of the Austrians from the Arsenal were Manin's first public measures. At the same time he prevented the mob from murdering their former oppressors. Manin devoted himself energetically to the organization of the inhabitants for self-defense. For a short time he had to give way to more radical leaders, but was soon recalled. During the invasion of Lombardy by Charles Albert of Sardinia, Manin laid down his authority; but on the defeat of the Sardinian army at Novara, March 23, 1849, he resumed power, and was the animating spirit of Venice during the heroic defense of the city for four months against the besieging Austrian army. On August 23d Venice capitulated; but Manin, with forty of the principal citizens, being excluded from the amnesty, quitted the city. He retired to Paris, where he taught his native language, declining innumerable offers of aid. He died of heart disease in Paris, September 22, 1857. Manin's public career was one of complete unselfishness. Believing as strongly as Mazzini in a republic, he was yet wise enough to see Italy's need, and from his exile in Paris he urged upon his compatriots coöperation with the Sardinian monarchy in effecting the union of Italy. Consult: Martin, *Daniel Manin and Venice in 1848-49* (trans. from the French, London, 1862); Rovani, "Di Daniele Manin memoria storica," in *Documenti della guerra santa d'Italia*, vol. iii. (Capolago, 1850); Reuchlin, "Daniel Manin," in *Historisches Taschenbuch*, vol. xxxii. (Leipzig, 1861); Vollo, *Daniele Manin* (Turin, 1860); Castille, "Manin," in *Portraits politiques au dix-neuvième siècle* (Paris, 1856). See ITALY; VENICE.

MANIOC (*Manihot utilissima*). A South American plant, of the natural order Euphorbiaceæ. Its starchy underground stems are used to make tapioca. See CASSAVA.

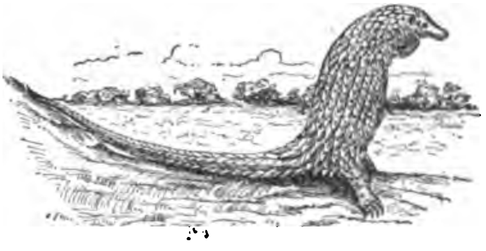
MANIPLE (OF. *maniple*, Fr. *manipule*, from Lat. *manipulus*, handful). (1) A narrow strip of silk worn on the left arm by the sacred ministers in a solemn mass. Originally it was a mere linen handkerchief, but since the eleventh century it has been made of the same material and color as the chasuble. When a bishop celebrates mass pontifically he assumes the maniple only at the *Confiteor;* otherwise it is put on in the sacristy with the other vestments. See COSTUME, ECCLESIASTICAL. (2) In the Roman military organization the legion (q.v.) was divided into thirty maniples, each commanded by a centurion, and consisting of about 100 men in the case of the regular infantry and 40 men among the *velites*, or light armed skirmishers.

MANIPUR, mä′nê-pōōr′. A native State of Northeastern India, situated between Assam and Upper Burma, and called by the Burmese Cassay or Kathe (Map: Burma, B 1). Its area is estimated at 8300 square miles. It consists chiefly of a deep valley amid the surrounding mountains. The industries are purely agricultural, the chief products being tea, cotton, rice, tobacco, opium and indigo. The State is administered by a raja, but has been a political dependency of Assam since 1825. In 1891, during the disputed succession to the throne, the British Commissioner, Resident, and several officers were treacherously murdered; a punitive expedition hanged the ringleaders, settled the succession, and resumed the administration under British supervision. Population, in 1881, 221,070; in 1901, 283,957, chiefly Hindus. Capital, Manipur.

The natives of Manipur consist of Manipuris proper, Nagas, and Kukis, all of whom are by tradition assigned to a common ancestry. The Manipuris call themselves Meithei, and since their conversion to Hinduism in the beginning of the eighteenth century they claim a Hindu origin. They are of the Mongoloid type of feature and do not resemble the Aryan or Aryanized peoples of Hindustan. Their language is closely allied to the Chin, Lushai, and Kuki tongues. Among the Meithei clan worship of tribal deities and peculiar rain ceremonies prevail, and ancestor worship was probably once in vogue. Each tribe seems to have a rain rite of its own. The Kukis are still migratory, but the Nagas live in permanent villages. Terrace cultivation with irrigation channels occurs in Manipur. The Nagas of Manipur and the mountains to the north are essentially Indonesians, and the Lushai of the south are Nagas mixed with Kyens and Burmese of Arakan. Consult: Grimwood, *Three Years in Manipur* (London, 1891); Dalton, *Descriptive Ethnology of Bengal* (Calcutta, 1872); Reid, *Chin-Lushai Land* (Calcutta, 1883).

MANIPUR. The capital of the native State of Manipur (q.v.), on the Namkathay River, 236 miles northwest of Mandalay (Map: Burma, B 1). The town is encircled by a wall and is the centre of a populous district. An export trade is carried on in cattle, tea, and rice. Here in 1891 occurred the massacre of British officials, which led to a change of administration and the establishment of a military cantonment. Population, in 1901, 67,093.

MANIS (Neo-Lat., assumed sing. of Lat. *manes*, ghosts; so called from the animal's nocturnal habits). The ordinary and generic name of the scaled anteaters or pangolins of the Old World edentate family Manidæ. Seven species are recognized, all inhabiting the tropical parts of Asia or of Africa. In general structure, as well as in habits, they resemble the American anteaters (q.v.), but are singular in having the body covered with horny imbricated scales, between which (except in the adults of the African forms) grow hairs; these scales are sharp-edged and are large upon the trunk and long terete tail, but small on the head, neck, and limbs. A common name is 'scaly anteater.' Their legs are short and strong, and their feet armed with powerful claws, with which they burrow, and in walking those of the fore feet are turned under. They feed, always at night, exclusively on ants and termites, which they procure by means of their long viscid tongue. All are able to roll



LONG-TAILED MANIS OR PANGOLIN.

themselves into a ball, which a man's strength is unable to open, and thus they present to their enemies only an armored surface, after the manner of armadillos. The largest species are those of Africa, and live upon the West Coast, one (*Manis gigantea*) reaching a length of six feet, including the tail. The one called 'phatagen' by the ancients was probably the long-tailed manis (*Manis macrura*). A third, the short-tailed (*Manis Temminckii*), ranges all across south-central Africa. The three Asiatic species are little different. One, common in India (*Manis pentadactyla*), has a body two and one-half feet long, and dwells in rocky places. A second species ranges eastward to China; and a third, more slender and long-tailed (*Manis Javanus*), is the one originally called by the Malays 'pangolin,' a term often now applied to the whole genus. They live well in captivity and become tame. Consult writers on the zoölogy of India and Africa. Also, Beddard, *Mammalia* (London, 1902); Hornaday, *Two Years in the Jungle* (New York, 1885).

MANIS'SA, or MANISA (the ancient Magnesia). A town of Asia Minor, in the Vilayet of Aidin, situated 20 miles northeast of Smyrna, with which it has railroad connection. It has numerous mosques, one Armenian and several Greek churches, four synagogues, and several notable secular buildings, among them the palace of Kara Osman Oglu. The chief industries are the manufacture of cotton goods and pack-saddles. Population, about 35,000, including 13,000 Greeks, 6000 Armenians, and 3000 Jews. For history and archæology, see MAGNESIA.

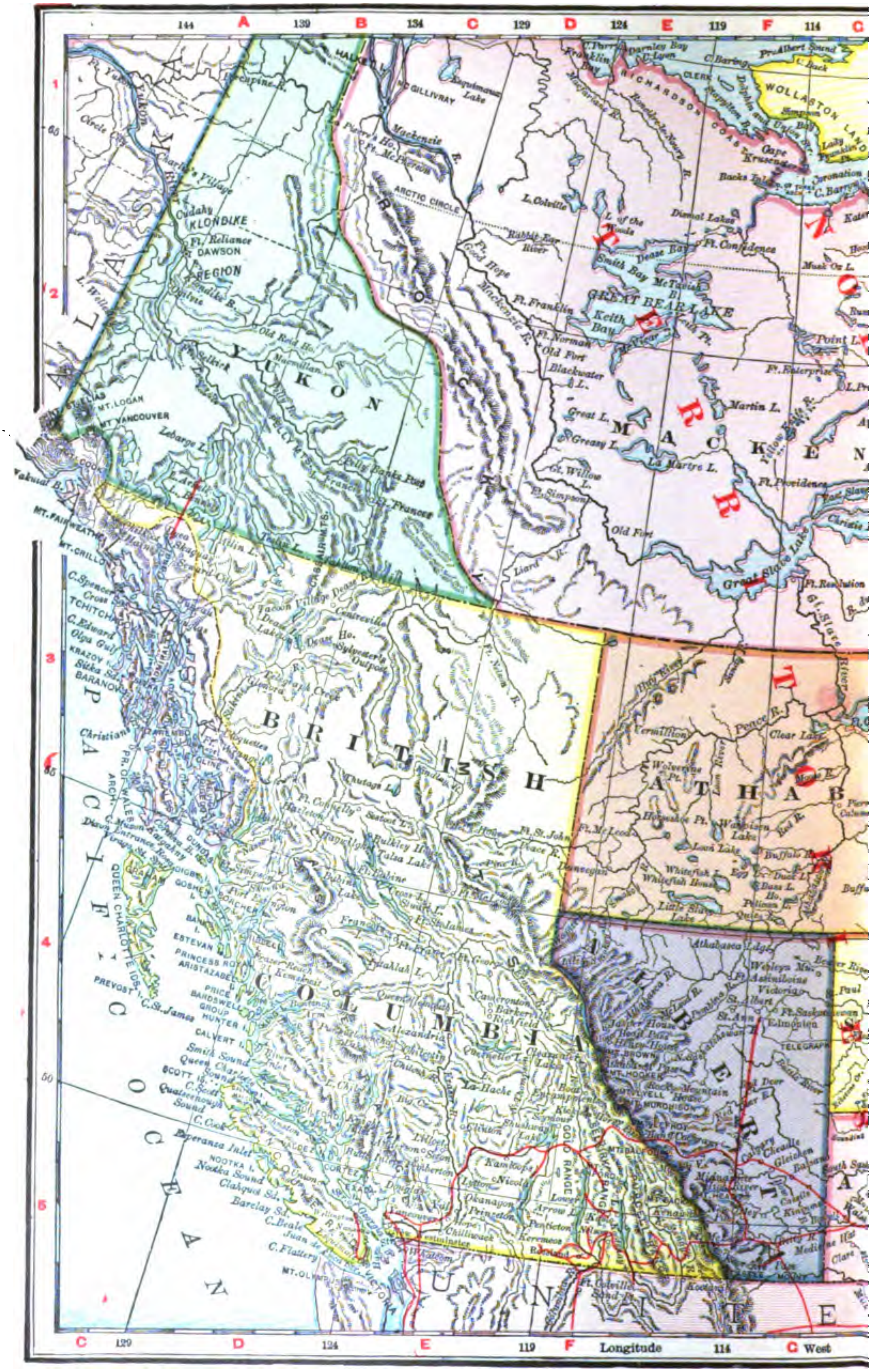
MANISTEE, măn'ĭs-tē'. A city and the county-seat of Manistee County, Mich., 270 miles northwest of Detroit; on the Manistee River, which flows between Manistee Lake and Lake Michigan, a distance of one mile, and on the Flint and Pere Marquette, the Manistee and Northeastern, and other railroads (Map: Michigan, G 4). It has a fine harbor and regular steamship communication, during the open season, with Chicago, Milwaukee, and other points on the lake. The city is in a fertile fruit-growing region, and its excellent transportation facilities have developed large commercial interests, particularly in lumber, shingles, and salt, all of which are manufactured on an extensive scale. There are manufactures also of furniture, foundry products, and sole leather. The principal points of interest are a fine court-house, several business blocks, two bridges across the Manistee River in the City Park, and Orchard Beach, a popular lake resort. Settled about 1849, Manistee was chartered as a city in 1869. The present government is administered under a revised charter of 1890 by a mayor, annually elected, a unicameral council, and subordinate officials. The city owns and operates the water-works. Population, in 1890, 12,812; in 1900, 14,260.

MANISTIQUE, măn'ĭs-tēk'. A city and the county-seat of Schoolcraft County, Mich., 107 miles west by south of Sault Sainte Marie; on Lake Michigan, at the mouth of the Manistique River, and on the Minneapolis, Saint Paul and Sault Sainte Marie, and the Manistique and Northwestern railroads (Map: Michigan, G 3). It has some reputation as a summer resort, but is known chiefly as an industrial and commercial centre, its trade being carried on both by rail and lake. The most extensive manufactures comprise lumber, iron, chemicals, alcohol, charcoal, and lime. The fishing interests also are important. There is a public library, founded in 1894. Manistique received a city charter in 1901. Population, in 1890, 2940; in 1900, 4126.

MANITOBA, măn'ĭ-tō'bȧ. A province of the Dominion of Canada, situated between 49° (the international boundary line) and 52° 50′ N. latitude, and between 95° and 101° 20′ W. longitude. It is bounded on the north by Saskatchewan and Keewatin, on the east by the latter and Ontario, on the south by the States of Minnesota and North Dakota, and on the west by Assiniboia and Saskatchewan. Its shape is almost a perfect square with straight sides, about 270 miles long, running along meridians and parallels. Area, 73,956 square miles, including 9890 square miles of water.

TOPOGRAPHY. The province belongs to the great central prairie region, except the northeastern portion, which is a part of the Laurentian country, and is broken and hilly, with a higher altitude than the adjoining region. The southeastern and central parts consist of an almost perfectly level lacustrine bed, the bottom of the Pleistocene Lake Agassiz. (See LAKE AGASSIZ.) It slopes very gently northward, being 800 feet above the sea in the south and 710 feet in the north. Its western boundary is formed by a line of escarpments with a maximum height of 500 feet above the plain and running southeast to northwest. These are the ancient shore lines of Lake Agassiz, and above them stretches a more elevated and undulating plain known as the Riding and Duck Mountains, which cover the western and southwestern parts of the province. Both this plain and the lacustrine plain below are treeless prairies, becoming gradually wooded northward, first along the river courses and in isolated clumps of poplars, and finally thickening into dense pine forests on the Duck Mountain in the northwest. The principal river is the Red River of the North, which enters the province from the south and flows through the prairies into Lake Winnipeg near the centre of the province. Its chief tributary is the Assiniboine, cutting through the western upland. Nearly all the rivers of the province have cut their beds through the soft drift deposits, so that they flow in narrow valleys from 30 to nearly 100 feet below the surrounding plains. As the waters of Lake Agassiz were drained off, the lowest depressions of its bed remained flooded and now form the great lakes of the province. Of these Lake Winnipeg is 270 miles long and from 20 to 60 miles broad; Lake Winnipegoosis 150, and Lake Manitoba 135 miles long. The last-named is very shallow, and the shores of all are low and marshy.

CLIMATE. The climate is very cold in winter and warm in summer. The mean annual temperature is 33°, and the extremes 95° and 40° or even 50° below zero. Both extremes, however, are rendered bearable by the dryness of the air; and the winter cold does not interfere with the wheat crops, as the sowing season arrives here even earlier than in the eastern provinces which lie farther south. The mean annual rainfall is only 17.43 inches, but 74 per cent. of it falls during the growing seasons, the winters being very dry and sunny, and the snowfall light.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Pelly R.
Lebarge L.
MT. LOGAN
MT. VANCOUVER
MT. ST. ELIAS
Yakutat B.
MT. FAIRWEATHER
MT. CRILLON
Skaguay
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Frances L.
Pelly Banks Post
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MACKENZIE
Mackenzie R.
ARCTIC CIRCLE
Ft. Good Hope
Ft. Franklin
Ft. Norman
L. Colville
GREAT BEAR LAKE
Keith Bay
Smith Bay
Dease Bay
Ft. Confidence
Great L.
Greasy L.
Gt. Willow L.
Ft. Simpson
La Martre L.
Martin L.
Ft. Providence
Great Slave Lake
Ft. Resolution
Liard R.
Old Fort
Blackwater L.
Rabbit Ear River
Dismal Lakes
Esquimaux Lake
Franklin Bay
Darnley Bay
C. Parry
C. Bathurst
RICHARDSON COAST
Dolphin and Union Str.
WOLLASTON LAND
Coronation G.
C. Barrow
Back's Inlet
TERRITORY
MACKENZIE
NORTH
ATHABASCA
Peace R.
Vermillion
Clear Lake
Whitefish L.
Lesser Slave Lake
Ft. St. John
Dunvegan
BRITISH COLUMBIA
Dease Lake
Telegraph Creek
Sylvester's Outpost
Babine L.
Ft. Connelly
Hazelton
Stuart L.
Ft. St. James
Ft. George
Fraser R.
Quesnel
Barkerville
Alexandria
Chilcotin
Kamloops
Nicola
Lytton
Okanagan L.
Princeton
Penticton
Kootenay L.
Vancouver
New Westminster
Victoria
QUEEN CHARLOTTE IDS.
GRAHAM I.
PRINCESS ROYAL I.
C. St. James
C. Scott
C. Cook
Nootka Sound
Barclay Sd.
Juan de Fuca Str.
C. Flattery
MT. OLYMPUS
ALBERTA
Athabasca Ldg.
Jasper House
Edmonton
Victoria
Ft. Saskatchewan
Calgary
Medicine Hat
Red Deer R.
MT. BROWN
MT. HOOKER
MT. MURCHISON
Rocky Mountain House
TELEGRAPH
Ft. Colville
UNITED STATES
PACIFIC OCEAN
Longitude
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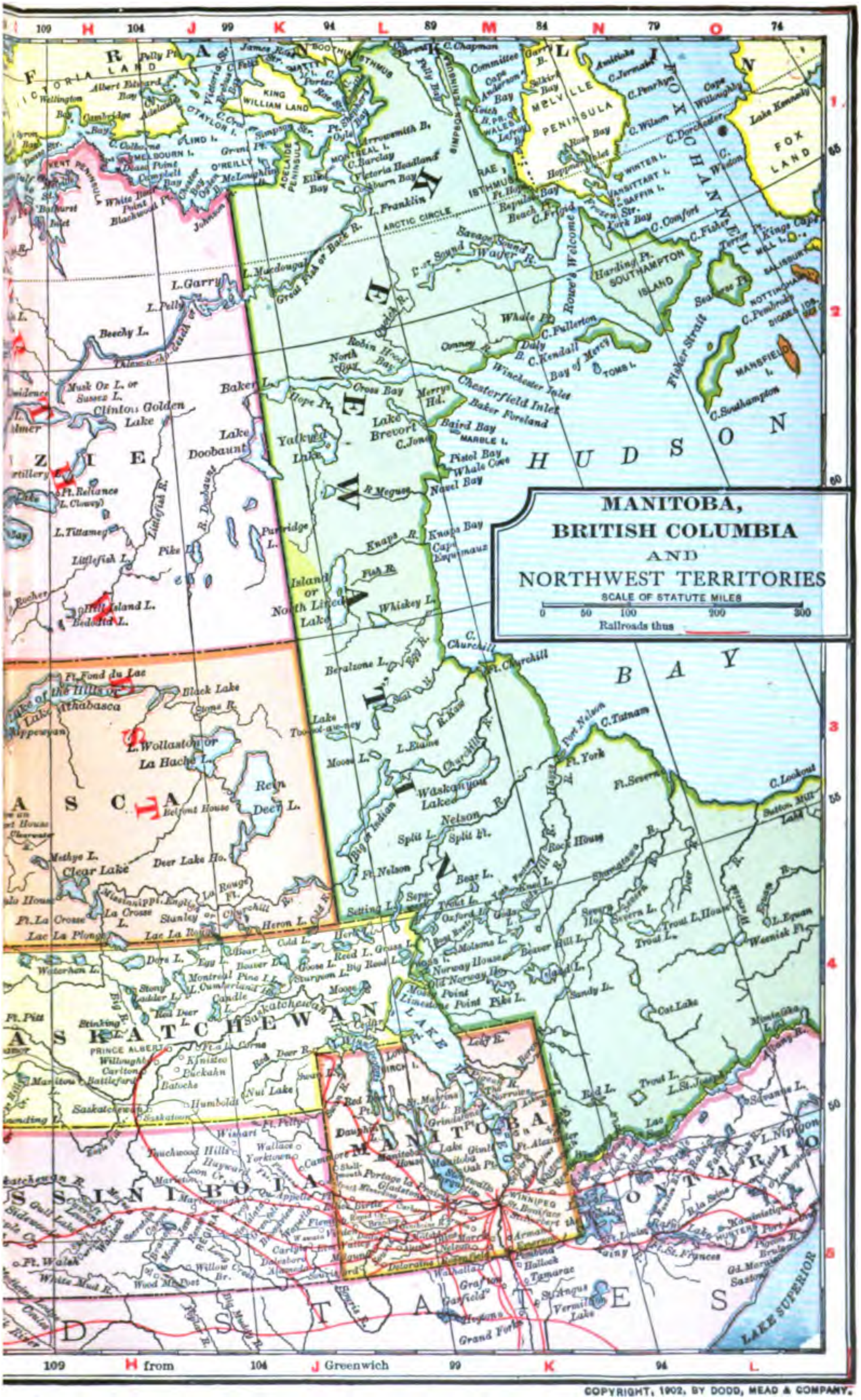

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Geology and Minerals. The Laurentian system of ancient crystalline rocks extends into the eastern part of the province as far as the east shore of Lake Winnipeg. It is bordered by a belt from 60 to 120 miles wide of Silurian and Devonian limestones running from southeast to northwest through the east central part of the province and forming the western shore of Lake Winnipeg. The remainder of the plains consists of Cretaceous and Laramie formations. Nearly the whole surface, however, is covered with a thick deposit of glacial drift. The principal minerals are lignite and coal, which are mined to some extent along the Souris River, near the southern boundary. By a recent law the settlers are allowed to mine for home use the outcropping coal on public lands by paying a small royalty to the Government. Some deposits of iron are also found, but are not worked.

Soil and Productions. The poor soils characteristic of the Laurentian region prevail in the eastern part of the province, and in the hills to the westward the soils are also of a poor quality. Over the greater portion of the western plains the soil consists of a very deep mold or loam with a tenacious clay subsoil. The best quality is found in the Red River Valley, which was formerly the bed of 'Lake Agassiz,' and the soil of which is therefore a lake deposit. The Red River Valley has become famous for its enormous production of the finest qualities of wheat. The region farther to the west also produces abundantly, and contains vast fields of wheat.

Agriculture. The main economic interests of the province centre in agriculture. The hardier grain and root crops are grown with great success, but the season is too short for corn. In extent of area the annual crop of wheat is greatly exceeded in many American States, but the grade of wheat is unexcelled. Oats is also extensively grown, and barley and potatoes are important crops. The acreage of the leading crops is shown in the following table:

	1901	1891
Wheat	1.965,200	896,622
Oats	573,858	256,211
Barley	139,672	56,506
Forage crops	43,667	
Flax	14,404	
Potatoes	16,042	9,791

In recent years a sentiment has developed in favor of mixed farming and giving greater attention to stock-raising. The grasses, both natural and cultivated, grow luxuriantly and afford excellent pasturage. The increase in the number of domestic animals is shown in the following table, taken from the census of 1901:

	1901	1891
Horses	163,867	86.735
Milch cows	141,481	82,712
Other horned cattle	208,405	147,984
Sheep	29,464	35,838
Swine	126,459	54,177

The dairy industry is rapidly developing, the value of the butter and cheese product in 1900 ($643,391) being nearly twice that of 1895. All the cheese reported and one-third the butter was factory-made.

Game and Fisheries. Large numbers of game and fur-bearing animals continue to abound in the northern regions, and are profitably hunted. Of greater importance are the resources of fish in the large lakes. Large quantities of white fish, pickerel, sturgeon, and other varieties are caught annually.

Transportation, Manufactures, Banks. The Dominion, provincial, and municipal governments have aided in the construction of railroads, and an admirable system has been developed in the southern portion of the province. The Canadian Pacific passes through it and establishes communication with both the Atlantic and Pacific oceans. Branch lines of the Northern Pacific Railroad pass up the Red River Valley and establish connection with the railroad systems of the United States. The Manitoba and Northwestern Railroad sends a line northward to Lake Winnipegoosis. These lines with their branches contained a total in 1901 of 2141 miles. The large lakes to the north, together with the Saskatchewan River system, afford possibilities for an extensive development of water communication with the region to the north and west—possibilities which have only just begun to be realized. The Red River to the south and the Assiniboine to the west are also navigable during the high-water season, but have been little used since the construction of railroads. Enormous quantities of wheat are annually exported to English markets. There are some flour and lumber mills and a number of small establishments engaged in manufacturing various articles, but on the whole the manufacturing industry is but little developed.

In 1899 the bank branches located in Manitoba numbered 46. In 1900 the clearing-house transactions at Winnipeg amounted to $106,900,000, making this place third among Canadian commercial centres in the importance of its clearing-house transactions. The Post-office Savings Bank had 37 offices in the province, there being 2012 depositors, and an average per capita deposit of $164.33. There was also one Government savings bank, with 4126 depositors, and an average per capita deposit of $230.24.

Government. The Government of Manitoba consists of a Lieutenant-Governor, appointed by the Governor-General and Council of Canada; an executive council of five members, responsible to the provincial Legislature, and the Legislative Assembly of 40 elected members. The seat of Government is Winnipeg. Up to 1890, French was the official language used by the Legislature. The common law of England is in force in the province. Manitoba sends four Senators and seven members of the House of Commons to the Dominion Parliament. Practically universal manhood suffrage exists, and the time requirement is one year in the province and three in the electoral division. The Supreme Court consists of the Chief Justice and three puisne judges. There are also county courts, police magistrates, and justices. The rural regions are organized into townships, and the denser units of population are organized into villages, towns, or cities, according to number of inhabitants. In each of these the governmental affairs are intrusted to a council (called board of aldermen in cities), as is true also of the counties, the members of the county council being elected by the townships and villages.

The receipts and expenditures show a gradual increase from less than $900,000 each in 1880 to about $1,000,000 each in 1900. The per capita expenditure of the latter year was $4.58, which was very much in excess of that of the other provinces, excepting British Columbia. More than half of this was met by the Dominion subsidy (see CANADA), the rest being collected from the sale of provincial lands, fees, licenses, and various other minor sources. After education, 'public works' constituted the largest item of expenditure ($236,000). Of charitable institutions the province maintains in whole or in part four general hospitals, two children's homes and a home for incurables, a deaf and dumb institution, a woman's home, and the Saint Boniface Orphanage. One of the five Dominion penitentiaries is located in the province.

RELIGION. The Roman Catholic Church was first in the field, missions having been established among the Indians at a very early day. Among the more recent colonists, however, the Protestants have greatly preponderated, the Catholics in 1901 numbering but one-sixth of the total population (35,622). A Roman Catholic archbishop resides at Saint Boniface, and the see-house of the Anglican Lord Bishop of Rupert's Land is at Winnipeg. Of the Protestants, the Presbyterians (65,310), Episcopalians (44,874), Methodists (49,909), Baptists (9098), Lutherans (16,473), and Mennonites (15,222) are the most important. There were 7998 Greek Catholics in 1901.

EDUCATION. Originally the school system of Manitoba recognized a complete separation of Catholic and Protestant schools, but in 1890 the schools were made undenominational; the act making this provision was unsatisfactory to the Catholics, and was amended in 1897 so as to admit of religious instruction when demanded by the parents of a certain number of pupils, but which would not be obligatory upon the other pupils, nor lead to the establishment of separate schools. In 1901 the school population numbered 63,881, of which 51,888 were enrolled in the public schools and 27,550 were in average attendance. In the same year there were 1669 teachers, of whom 618 were males. The expenditure exceeds $20.00 per enrolled child, more than one-half of which is raised by municipal taxes. The province maintains a high school at each of the largest towns and a normal school at Winnipeg. The provincial university has no teaching faculty, but examines and graduates students from the various denominational colleges. There are four such colleges at Winnipeg, maintained by Episcopalians, Roman Catholics, Presbyterians, and Methodists.

POPULATION. The population of Manitoba has been acquired almost wholly since 1870. In that year there were only 2000 whites in the province and an Indian half-breed population of about 10,000. In 1881 the population had increased to 62,260, in 1891 to 152,506, and in 1901 to 254,947. In 1901 the foreign born population numbered 73,726, the leading nationalities represented being: English, 20,392; Austrians, 11,570; Russians and Poles, 8854; Scotch, 8099; Icelanders, 5403; Irish, 4537. The United States at that date had contributed 6922, but this number was greatly augmented in the period immediately following. There were still 5827 Indians in 1901, and there were 10,372 half-breeds. Winnipeg had in 1901 a population of 42,340; Brandon, 5380; Portage la Prairie, 3901; West Selkirk, 2188; and Boniface, 2019.

HISTORY. In 1811 the Earl of Selkirk, a member of the Hudson's Bay Company, attracted by the fertility of the soil on the banks of the Red River, obtained from the company a grant of a large tract of land on both banks of the river, extending some distance within the present frontier of the United States. The following year he brought out a number of settlers from the Highlands of Scotland. The right of the Hudson's Bay Company to grant this land was, however, disputed by the Northwest Company; and when the settlers commenced to build, they were driven off by the servants of the Northwest Company. Hostilities continued between the servants of the two companies for several years, and in 1816 there was a pitched battle between them. The Earl of Selkirk, arriving soon after, found his settlers scattered; but by his energetic measures, and by help of 100 disbanded soldiers from Europe whom he had brought with him, he secured for his old and new protégés a peaceful settlement. They established themselves near Fort Garry, and in 1817 the Earl obtained from the Indians a transfer of their right to the land two miles back from the Red River on both sides. Still the settlers had some difficulties to overcome, especially from visitations of grasshoppers. These were gradually surmounted; but the population, including now a large number of half-breeds, remained very isolated, having little communication with the outside world.

In the year 1869 the Hudson's Bay Company surrendered all their claims to the Northwest Territories to the British Government, which in the following year transferred that region to Canada. While the proposed transfer to the British Crown of the Hudson's Bay Company was pending, this portion of their dominions was the scene of considerable contention and violence. The French-speaking population, led by Louis Riel, a half-breed, organized a force, imprisoned their English and Scotch opponents, seized Fort Garry, established a provisional government, robbed the strong box, and dictated terms to the Governor of the Hudson's Bay Company, to which he had to submit. A military force arrived in the province in July, 1870, and Riel, fearing capture, fled, upon which the insurrection collapsed; but, returning, he incited a second uprising (1885), which was soon suppressed, and Riel, being captured, was hanged. In 1870 that portion of the Red River district between longitude 96° and 99° W. and latitude 49° and 50° 30′ N. was organized as the Province of Manitoba, and its admission to the Confederation took place in July of the same year. The boundaries were subsequently greatly extended.

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MANITOBA, Lake. A body of water in the Province of Manitoba, Canada, intersected by the 51st parallel and the 99th meridian (Map: Manitoba, K 4). It is about 60 miles southwest of Lake Winnipeg, which receives its waters through the Saskatchewan, or Dauphin River, which, near the middle of its course, expands into Saint Martin's Lake. Manitoba Lake is about 125 miles long, and about 25 miles wide; area, about 1900 square miles. It is 40 feet higher than Lake Winnipeg, and navigable for vessels drawing ten feet of water. It abounds in fish, and its shores are resorted to by sportsmen for moose, elk, deer, and wild fowl. At its northern end it receives the waters of several smaller lakes, and at the south those of the White Mud River. The scattered settlements around are inhabited chiefly by Norwegians and Icelanders.

MANITOU, măn'ĭ-tōō. A town in El Paso County, Col., six miles northwest of Colorado Springs; on the Colorado Midland and the Denver and Rio Grande railroads (Map: Colorado, E 2). The centre of a region renowned for wonderful scenery, Manitou is situated over 6300 feet above the sea, at the junction of and in three cañons—Ute Pass, William's Cañon, and Engleman's Cañon—at the foot of Pike's Peak (q.v.). Six important mineral springs, which are valued for their medicinal properties, and the many natural attractions of the vicinity, combine in making Manitou one of the most popular health and pleasure resorts in the United States. The varied features of interest besides the Pike's Peak Cog Railway, which terminates here, comprise caves, cañons, falls, and drives, and Monument Park (see illustration under Erosion), and the famous Garden of the Gods (q.v.), both containing picturesque formations of red and white sandstone. The population in summer is estimated at between 5000 and 8000. Population, in 1890, 1439; in 1900, 1303.

MANITOU, or **MANITO** (Algonquian Indian, mystery, supernatural). The most striking phase of the animistic beliefs of many American Indian tribes, not only in the Algonquian division, but, under other names, in other stocks as well. It appears to be a rather vague spiritual entity, which becomes specialized and personified in various individual forms. There are thus an indefinite number of individual manitous which play an all-important rôle in the religious beliefs and mythologies of the Indians. Considering the manitous as personal spirits in many cases, and hence of varying ranks, early observers fell into the error of regarding the particular one which played the most conspicuous part in the mythology of the tribes with which they were dealing as an omnipotent being or 'Great Spirit,' as it came to be called, and the spread of this error has tended to perpetuate a great misconception in the popular mind regarding Indian religious beliefs. It is fairly evident that there is not and never was in primitive Indian beliefs any conception corresponding to the modern civilized idea of God or Deity. The manitou might be a supernatural being of any grade however low, and, further, anything mysterious or beyond comprehension was 'manitou.' Another term of Chinook origin, viz. 'tamanuus,' is now widely used, in the Northwest of North America to express much the same conception, and the cult of the tamanuus as a protecting spirit of an individual has thrown much light on shamanistic customs and beliefs and is quite probably connected with the totemic practices of the tribes of that region. A similar conception is termed 'wakanda' by the Sioux. See Indians, American; Totemism.

MANITOULIN (măn'ĭ-tōō'lĭn) **ISLANDS.** A group situated in Lake Huron, from whose northern shore it is separated by a channel varying from 7 to 18 miles in breadth (Map: Ontario, A 2). It comprises Grand Manitoulin, or Sacred Isle; Little Manitoulin, or Cockburn Isle, belonging to Britain; and Drummond Isle, belonging to the State of Michigan. Grand Manitoulin is 90 miles long by 5 to 30 broad; Little Manitoulin is circular in shape, and has a diameter of 7 miles; Drummond Isle is 24 miles long by from 2 to 12 broad. All are irregular and striking in their natural features; the first two are covered with large and dense forests of pine. The islands afford good fishing and the various villages on them are favorite summer resorts. Half of the resident population are Ojibway Indians. Population, 2000.

MANITOWOC, măn'ĭ-tō-wŏk'. A city and the county-seat of Manitowoc County, Wis., 75 miles north of Milwaukee; on Lake Michigan, at the mouth of the Manitowoc River, and on the Chicago and Northwestern and the Wisconsin Central railroads (Map: Wisconsin, F 4). It has a fine harbor with good docking facilities and considerable lake commerce, the shipments being principally grain, flour, cheese, leather, etc. The industrial establishments include cigar factories, breweries, shipyards, grain elevators, tanneries, planing mills, brick yards, furniture and canning factories, foundries, machine shops, and edge tool and agricultural implement works. The County Insane Asylum and a Polish orphan asylum are situated here. Manitowoc was chartered as a city in 1870. Population, in 1890, 7710; in 1900, 11,786.

MANIZALES, mä'nā-sä'lās. A town of Colombia, in the Department of Antioquia. It is situated on the southern boundary of the department, 100 miles northwest of Bogotá, and at the junction of the main routes over the Central Cordillera, 7000 feet above sea-level (Map: Colombia, B 2). It was founded in 1848, and has had a very rapid growth, being now one of the most populous towns of the department, the second in commercial and the first in strategic importance. It has gold-mining and stock-breeding industries, a bank, and a public library. The population in 1895 was about 15,000. The town was the headquarters of the rebels during the civil war of 1877-78.

MANKATO, măn-kä'tō. A city and the county-seat of Blue Earth County, Minn., 90 miles southwest of Saint Paul; at the confluence of the Minnesota and Blue Earth rivers, and on the Chicago and Northwestern, the Chicago, Milwaukee and Saint Paul, the Chicago, Saint Paul, Minneapolis and Omaha, and the Chicago Great Western railroads (Map: Minnesota, E 6). It has a State normal school, a handsome Federal building, the Tourteilotte Hospital, Saint Joseph's Hospital, and a Carnegie public library. The city is in an agricultural section, with valuable forests and extensive quarries of stone in the vicinity, and has creamery package and candy factories, flour and knitting mills, breweries, foundries and machine shops, and lime and cement works. The government is administered, under a charter of 1891, by a mayor, elected every two years, and a unicameral council. Mankato was settled in 1853 and was incorporated first in 1868. It was in the midst of the territory affected by the Sioux outbreak of 1862-63, being the scene of several massacres. In 1862 thirty-eight Indians convicted of murder were hanged here. Population, in 1890, 8838; in 1900, 10,599.

MAN'LEY, JOHN (1733-93). An American naval officer, born at Torquay, in England. He removed to Marblehead, Mass., and at the outbreak of the Revolution joined the naval forces of the colonies. Washington appointed him commander of the Massachusetts State cruiser *Lee,* in which capacity he rendered efficient service during the siege of Boston by intercepting British supplies. In 1776 he received from Congress a commission as captain of the new cruiser *Hancock*, and soon after putting to sea captured the British man-of-war *Fox*. Not long afterwards, however, while cruising in company with the *Boston*, he fell in with the two British men-of-war *Rainbow* and *Victor*, and, being deserted by his consort, was captured. Later he commanded two privateers and the Government frigate *Hague*, in which he was attacked by a superior British force, but managed to make his escape.

MANLEY, MARY DE LA RIVIÈRE (c. 1672-1724). An English author, born about 1672 in Jersey, or at sea between Jersey and Guernsey. Having been betrayed about 1688 by her cousin, John Manley of Truro, she lived for a time with the Duchess of Cleveland, wrote plays and short novels, and succeeded Swift as editor of the *Examiner* (1711). She died at Barber's printing house on Lambeth Hill, July 11, 1724. Mrs. Manley employed her talents mainly in depicting the scandalous life of the times. *Letters Written by Mrs. Manley* (1696) and the *Secret History of Queen Zarah and the Zarazians* (1705) were followed by the *New Atalantis*, of which two volumes appeared in 1709. With this famous work were afterwards incorporated *Memoirs of Europe* (1710) and a further continuation. In 1720 appeared a series of short tales called *The Power of Love, in Seven Novels.* Incidents in her own career Mrs. Manley related in the *Adventures of Rivella* (1714).

MAN'LIUS. A Roman family, some of whose members played an important part in the history of the Republic. (1) MARCUS MANLIUS CAPITOLINUS, who was consul in B.C. 392, and two years later gained his surname by rescuing the Capitol from the attacks of the Gauls. From this time forward he courted the favor of the lower classes, and in 381 was arraigned before the centuries and sentenced to be thrown from the Tarpeian Rock. The name of Marcus was never after borne by any of the Manlian gens, who considered him a traitor to his family and class. (2) LUCIUS MANLIUS IMPERIOSUS, dictator B.C. 363. (3) TITUS MANLIUS IMPERIOSUS TORQUATUS, son of Lucius, military tribune, twice dictator (B.C. 353, 349), and three times consul. His surname was derived from his having despoiled a gigantic Gaul of a golden chain (*torques*) after having slain him in single combat. In his last consulship he waged a successful war against the Latins and caused to be put to death his own son, who had disobeyed his orders by engaging in single combat with the enemy. (4) TITUS MANLIUS TORQUATUS was consul in B.C. 235 and in 224. In the latter year he defeated the Gauls and crossed the Po, and some years later was victorious over the Carthaginians. (5) GNEIUS MANLIUS VULSO, consul B.C. 189. He was victorious over the Galatians in Asia Minor.

MAN MILLINER, THE. A nickname given to Henry III. of France on account of his effeminacy and fondness for dress.

MANN, HORACE (1796-1859). An American educational reformer and philanthropist, born at Franklin, Mass., May 4, 1796. He was graduated at Brown University, 1819. Studying law, he was admitted to the bar in 1823; in 1827 he was elected to the State Legislature of Massachusetts, and, six years later, to the State Senate, over which he was chosen to preside in 1836. From the beginning of his legislative career he became a leader in philanthropic and reform movements of various kinds. In 1837 the State Legislature appointed a board of education to revise the school laws and to reorganize the common-school system of the State. Of this board Mr. Mann was made secretary, and for twelve years he devoted to this cause all his time, often against the most bitter opposition. This was the great work of his life, for the movement begun under his leadership was not confined to Massachusetts, but affected the entire United States, and led to the development of the free public-school system as it exists to-day. These reforms were instituted through various instrumentalities, chief among which were his annual *Reports*, as secretary. The twelve volumes of these *Reports* (1837-48) have become educational classics, and were reprinted in Europe as well as circulated throughout the United States. In addition to these he also founded and edited the *Common School Journal*, through which he advocated his reform ideas. Finally, through a very great number of teachers' institutes and meetings to which he gave indefatigable attention, he inspired the teaching body to greater efforts and with higher ideas.

In the course of his reform efforts he visited the schools of Continental European countries and introduced, against a storm of opposition, many of the advanced ideas of school work, especially those growing out of the Pestalozzian movement (q.v.). The immediate work of Mann, however, which was of the greatest importance, was the reorganization of the common-school system of Massachusetts. Since the dominance of the democratic sentiment during the latter half of the eighteenth century the unit of school organization had been the district instead of the town. In place of the district, Mann sought to restore the more centralized control of the town, which would give a broader public support, a greater freedom from factional quarrels, a better financial basis, a better prepared and better remunerated staff of teachers, and better equipment. Though the reform was not accomplished until after Mann's withdrawal from the secretaryship, and in fact not finally settled until after a bitter conflict lasting a quarter of a century, yet his efforts developed the public sentiment that finally established the more centralized control of education, and gave to this organization when established a far better support than education had ever received. But one service to education rendered by Horace Mann is to be rated above even all these. It was owing to his efforts that the first normal school (q.v.) in the United States for the training of teachers was established. This first school was opened in 1839 at Lexington, Mass. In 1848 Mann was elected to Congress to fill the vacancy caused by the death of John Quincy Adams. There for two terms he continued the work begun by Adams in opposition to slavery. From 1852 to 1859 Mann was president of Antioch College, Yellow Springs, Ohio, where he again led in an advanced educational movement—that of the co-education of the sexes.

Horace Mann was not a professional educator, however, but a publicist and statesman. His greatest work was the rather indefinite one of arousing public opinion to the importance of education, and the directing of legislative effort to the improvement of educational conditions. He became the leader, or at least the forerunner, of the great educational movement which has reached from the middle of the nineteenth century to the present time.

In addition to his *Reports*, his published works include: *Lectures on Education* (1840); *Lectures on Education* (1845); *On the Study of Physiology in Schools* (1850); *Slavery, Letters and Speeches* (1850); and numerous lectures and addresses. Consult: Mary Peabody Mann, *Biography of Horace Mann* (Boston, 1865); Hinsdale, *Horace Mann and the Common School Revival in the United States* (New York, 1898); Boone, *Education in the United States* (New York, 1889); Lange, *Horace Mann: His Life and Educational Work* (New York, 1893). See the articles on COMMON SCHOOLS; NORMAL SCHOOLS.

MANN, MATTHEW DERBYSHIRE (1845—). An American obstetrician, born at Utica, N. Y. He graduated at Yale in 1867 and at the College of Physicians and Surgeons in New York City in 1871. After two years' study in Heidelberg, Paris, Vienna, and London he practiced in New York City until 1879, then in Hartford until 1882, when he became professor of gynecology in the University of Buffalo. He was one of the physicians attendant upon McKinley after the President's assassination. He wrote: *Immediate Treatment of Rupture of the Perineum* (1874); *Manual of Prescription Writing* (1879); and *American System of Gynecology* (1887-88).

MANN, WILLIAM JULIUS (1819-92). An American Lutheran theologian and author, born in Stuttgart. He studied there and at Tübingen and was ordained in 1841. Three years later he came to the United States and settled in Philadelphia, where he was pastor of the Reformed German Church from 1846 to 1850, and of Zion's and Saint Michael's Church from 1850 to 1884. He was made professor of symbolics at the Lutheran Theological Seminary in 1864, a post he held almost up to the time of his death. With Dr. Schaff he edited *Der deutsche Kirchenfreund.* His own works include: *Plea for the Augsburg Confession* (1856); *Lutheranism in America* (1857); and *Life and Times of Henry Melchior Muhlenberg* (1887). Consult: Spaeth, *Memorial* (Philadelphia, 1893); and Mann, *Memoir* (Philadelphia, 1893).

MAN'NA (Heb. *mân*, Ar. *mann*, Gk. μάννα, *manna;* perhaps connected with the Egyptian *mennu*). According to the biblical account, the chief food of the Israelites during their forty years' wandering in the desert (Ex. xvi.; Num. xi. 6-9). It is described as falling from heaven like rain or with the dew; small, round and white, like coriander seed; in taste, sweet like honey, or like fresh oil. It was gathered in the morning and it melted when the sun arose. A sufficient amount was provided daily for each individual and no more; if a surplus was gathered it spoiled before the succeeding morning. On the sixth day, however, a double portion was provided, and none could be found on the Sabbath. It could be ground in a mill, beaten in a mortar, baked and made into cakes, or boiled. A command was given to preserve an omer of it in the ark of the covenant for future generations (cf. Heb. ix. 4). The supply ceased on entrance into the promised land (Joshua v. 12). In Ex. xvi. 15 the name is explained by a reference to the exclamation of the Hebrews when they first saw the manna and knew not as yet what it was, *mân* being made equivalent to *mah,* 'what is it?' This explanation is probably a species of popular etymology, and indicates that the true origin of the word was unknown. In the later literature manna is called 'corn' or 'bread of heaven' and 'angels' food' (Psa. lxxviii. 24-25; cv. 40; cf. John vi. 31; I. Cor. x. 3). Attempts have been made to explain the biblical manna as the exudation from the tarfa tree, a species of tamarisk (*Tamarix gallica mannifera*), or the camel's thorn, or as lichens. Manifestly such an explanation fails to satisfy all the conditions of the narrative. If it be believed, however, that the latter represents an early tradition with later embellishments, the view becomes plausible that the use of some such food by a small tribe or clan in time of need may have formed the basis of the narrative. The passage in Numbers is attributed to the Yahwistic writer, and hence is pre-exilic; that in Exodus is found in the Priestly narrative, but it probably embodies certain old fragments with considerable additions by the redactors. Consult the commentaries of Dillmann, Baentsch, and Strack on Exodus xvi.

MANNA. A sweet substance that exudes from incisions in the stems of Fraxinus ornus and other species of ash. The principal supply of manna comes from Sicily, where during July and August incisions are made in the trunks and larger limbs of the trees, and if the weather be warm the manna begins to ooze from the cuts and hardens into lumps or flakes which are removed by collectors. Manna is a light, porous substance of a yellowish color, not unlike dried honey. There are different qualities found upon the market, which vary in their purity and composition. Flake manna is obtained when there is an abundant flow from the upper incisions. It dries into flat pieces or tubes and differs somewhat in composition from the other varieties. Small or talfa manna occurs in tears from the lower incisions and is less crystalline and more gummy. Fat manna is brownish, viscid, noncrystalline, and is usually full of fragments of bark and other impurities. Manna is largely used in medicine as a laxative, demulcent, and expectorant, and is commonly administered with other medicines, as senna, rhubarb, etc. Its con-